JOURNAL

OF THE

FRANKLIN INSTITUTE

OF THE

State of Pennsylvania,

DEVOTED TO THE

MECHANIC ARTS, MANUFACTURES, GENERAL SCIENCE,

AND THE RECORDING OF

AMERICAN AND OTHER PATENTED INVENTIONS.

DECEMBER, 1835.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

Description of a successful Experiment with the Heated Air Blast, made at the Oxford Iron Furnace, New Jersey.

(WITH A COPPERPLATE.)

During a recent visit to Oxford Furnace, in Warren county, New Jersey, on some observations connected with the mineralogy of that neighbourhood, my attention was drawn to an arrangement for applying the *hot blast*, which much interested me, on account of the economical simplicity of its construction, and the encouraging results obtained through it.

Upon expressing a wish to make public, through the Journal of the Franklin Institute, this first successful experiment of the kind in our country, I was furnished by Mr. Henry, the enterprising conductor of the furnace, with a detailed description of the whole attempt. In a spirit of liberality worthy of all praise and imitation, he placed in my hands all his memoranda, exposing the history of the comparative efficacy of the hot and cold blast at this furnace, and, furthermore, gave me possession of drawings of a new and improved form of the apparatus for heating, which he is now constructing, to be put into operation when the furnace again goes into blast.

In the hope that the brief account which I have to offer, may prove of some service in promoting the introduction of that which is con-

fessedly the greatest of modern improvements in the important art of smelting iron, I beg leave to state the comparative trials of the two species of blast at this furnace, in the order in which the furnace was worked, the better to make their relative effects understood.

It should be borne in mind that this experiment, as far as it has yet proceeded, professes to be merely a preliminary attempt, introductory to a more permanent arrangement, hereafter to be adopted; and it is felt to be defective, therefore, in several points. For example, the *temperature* of the air used in the blast was found to be quite too low to ensure that full result which the mode of apparatus employed is supposed capable of yielding. The experiment was imperfect, moreover, from the absence of any precise instrumental observations to ascertain exactly what the temperature of the air was.

To make more intelligible the amount of benefit derived from the heated blast, it seems proper to furnish a brief statement of the capacity of the furnace, and its operation when under the cold blast.

Oxford Furnace passed into the hands of its present enterprising masters, Henry, Jordan & Co., in 1832, and was worked during that and the two succeeding years, on the ordinary plan, with cold air. The partial experiment with heated air was made during the months of June and July, of the present year, 1835.

The height of the furnace stack, from the tunnel head to the bottom stone, was, at first, 33⅓ feet, but was afterwards, in 1834, reduced to 31⅓ feet; the height of the hearth to the boshes is five feet; the inclination of the boshes was at first eleven inches to the foot, and was subsequently changed to ten and a quarter inches to the foot, at which it stood during the employment of the heated air.

In the more complete arrangement for applying the hot blast, about to be introduced, the inclination of the boshes is to be altered to nine and a half inches. This is in consequence of the increased temperature within the furnace making it necessary to give more support to the burden. The width on the boshes is six feet six inches, and in the tunnel sixteen inches.

With these dimensions, the rate of working, or yield, of the furnace, was,—

In 1832, for nineteen weeks and four days, 327⅓ tons, or an average of 16.7 tons per week.

In 1833, the product for thirty-two and a half weeks, 638.1 tons, or 19.6 tons of iron per week.

During this year, the quantity of charcoal consumed in making one ton of iron was 243 bushels, of eighteen pounds to the bushel.

In 1834, still using the cold blast, but employing an improved quality of charcoal, the product, for twenty weeks and five days, was 240.4 tons, or 11.6 tons per week.

So low a product was due to the hard and refractory character of the ore then used. It was taken from a considerable depth, was very compact, and a portion of it yielded iron having the quality called red short. This year, the consumption of coal to the ton of iron, was 226 bushels of a coal weighing twenty-two pounds to the bushel.

In 1835, the coal being similar to that of the previous year, and the ore of its ordinary much better quality, the product of iron was at the rate of 18.9 tons per week.

While the smelting with heated air was in progress, the consumption of coal to the ton of iron was only 165 bushels, being a saving, compared with the previous year, of sixty-one bushels per ton.

It should be mentioned, moreover, that the new blast was applied in the months of June and July, a season when the product of a furnace is well known to be less than its average rate for the whole year.

The charcoal employed in the Oxford furnace, is a mixture of oak and chesnut, about two-thirds oak. Much commendable care is employed in its manufacture, so that a cord of 128 cubic feet is required to yield at least forty bushels, of a capacity of 2356 cubic inches to the bushel.

The flux used is the blue limestone of the vicinity of Scott's mountain, where the furnace is situated.

The ore smelted at this furnace is the magnetic oxide of iron. It is mixed with but little foreign matter, and occurs in veins, several feet wide, in Scott's mountain. It makes an excellent, tough, bar iron, and is also well adapted, and extensively used, for making castings, and pig iron.

Description of the Apparatus for Heating the Blast.

This plan of supplying the furnace with air at an elevated temperature, is upon a principle said to be in use in Germany. It consists in urging the cold air from the bellows, through tubes laid adjacent to the most highly heated part of the furnace, in place of heating it by separate fuel, in an apparatus detached from the furnace. The contrivance is this: Two hollow cast-iron boxes, 2 feet 9 inches high, 15 inches deep, and 8 inches wide, are set into the masonry, on each side of the false tymp, and placed directly in contact with the main tymp, and with their broadest sides facing each other. A series of tubes, eighteen in number, pass from one box across to the other, and are so arranged immediately above the top of the false tymp, that the flame which plays in front of the main tymp, and under the sow, may pass around them as freely as possible. The interior diameter of the tubes is two inches. Their position in front of the hottest part of the furnace is such as to enable them to be highly heated, as well by the external flame, as by the heat radiated from the main tymp.

The air in being urged through these tubes, is, therefore, made to acquire a very considerable elevation of temperature.

In the diagram before us, fig. 1, *a* represents the large pipe which brings the blast from the bellows to the heating apparatus. It is curved, in order to pass round from the side of the furnace where the tuyere is, to the front. It passes close to the main tymp, and enters the remote box, *b*. From this the air escapes through the tubes into the opposite box, *b'*, and finds its exit thence through the curved

pipe, *c*, which leads it in a heated state to the tuyere; *d* represents a side view of the boxes, *b*, *b'*.

No arrangement was made for measuring the temperature of the air, as it issued from the second box, further than adapting a valve in the side of the pipe, *c*. The temperature, estimated there by the sensation on the hand, was judged to have been about 200° of Fahrenheit.

In the improved mechanism for heating the air, which is intended to take the place of this, there will be a thermometer to indicate the temperature of the passing air precisely.

At the same time that the apparatus here described was erected, a modification in the false tymp was made, to keep it cool, and thus prevent that rapid destruction of it, to which it is liable, under the high heat of the front of the furnace. It was designed to achieve this by making it a hollow cast-iron box, and transmitting through the interior a current of cold water, to enter below, and to issue at top.

The thickness of the iron in the bottom of this hollow false tymp, was two inches at bottom; at the back, it was one and a half inches; and in front it was one inch. It was found, however, not to be stout enough beneath, for it soon gave way under the action of the fire.

Imperfect as Mr. Henry admits the above arrangement to have been, he was fully convinced, during the trial, of the useful results to be procured from such a form of apparatus.

Independently of the very considerable saving of sixty-one bushels of the best charcoal to each ton of iron, there was a steadiness in the working of the furnace, and, therefore, an uniformity in the quality of the iron, of no small object in every extensive establishment.

As a consequence of this regularity in the action of the furnace, it was found that the superintendence of the man who managed the tuyere could almost be dispensed with; so much so, that even after casting, during which the blast is usually taken off, no scraping of the tuyere was necessary to detach the congealed cinder which commonly adheres, proving how much higher the temperature of the furnace remains, when the heated air is employed. It would seem, indeed, that weather and season have little or no effect in deranging the working of a furnace driven by the hot blast.

It remains to describe concisely the other form of the apparatus for heating the air, which Mr. Henry is now constructing.

The object of this, which is upon the same principle as the first, but considerably modified and improved, is to procure a higher temperature in the blast, and, at the same time, to preserve the desired coolness in the false tymp, by passing the *blast* through it, in substitution of the water before employed. The false tymp is, therefore, hollow, and forms a part of the chain of connection through which the air from the bellows is made to circulate.

Fig. 2 shows the position of the semicircular pipe, which leads the cold air from the bellows, round the stack, to the side of the main tymp; here the pipe descends to enter the side of the false tymp, an end view of which is seen in fig. 3.

In fig. 3, a profile, or side view, is presented, of the manner in

Fig 1.

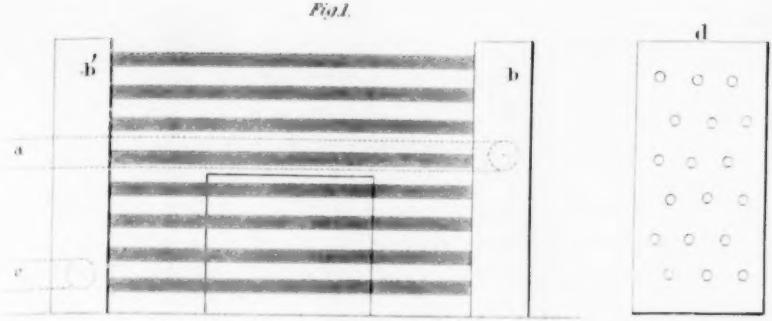

b'
b
a
c
d

Fig 2.

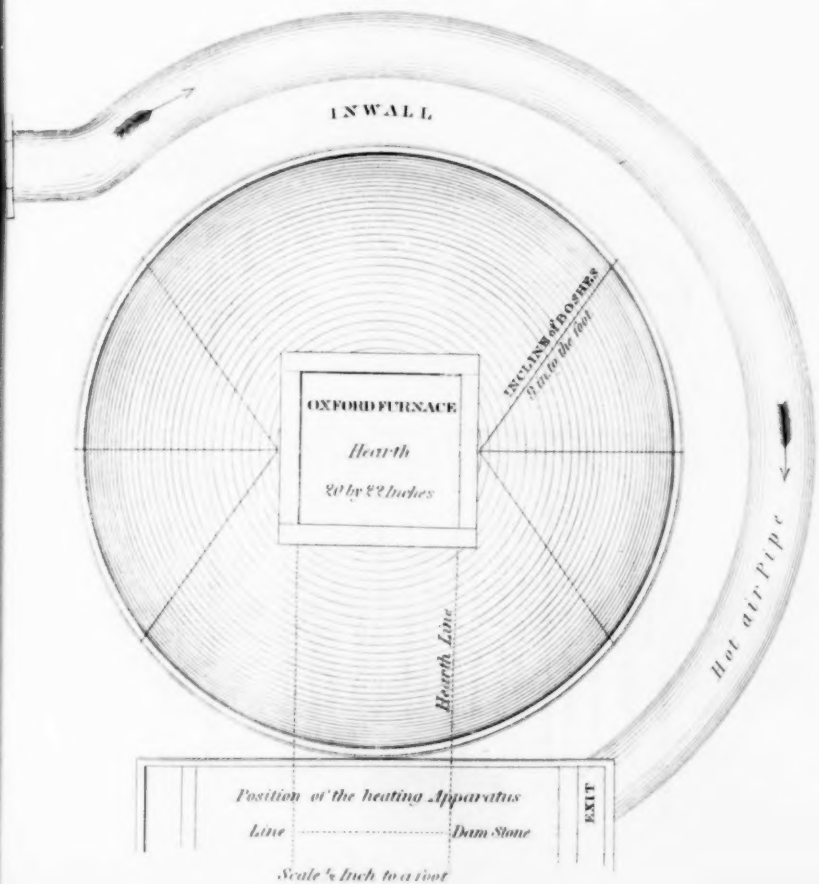
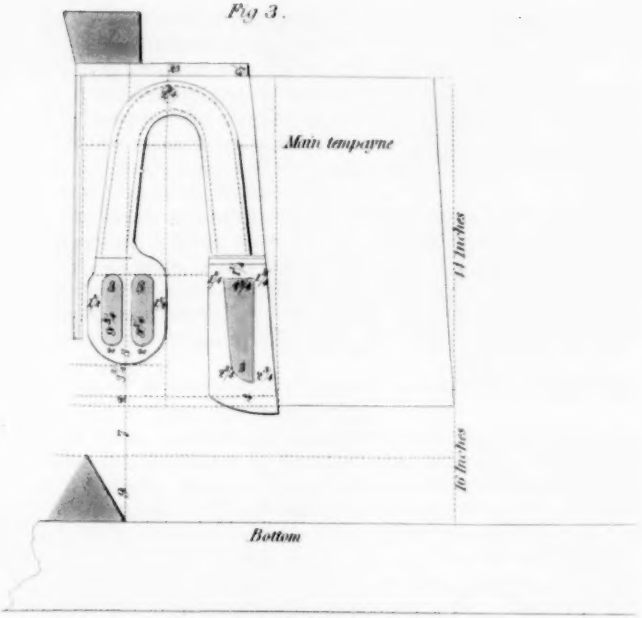

INWALL
OXFORD FURNACE
Hearth
20 by 22 Inches
INCLINE of 8 INCHES
8 cm to the foot
Hearth Line
Hot air pipe
Position of the heating Apparatus
Line
Dam Stone
EXIT
Scale ½ Inch to a foot

Fig 3.



Scale ½ Inch to a foot

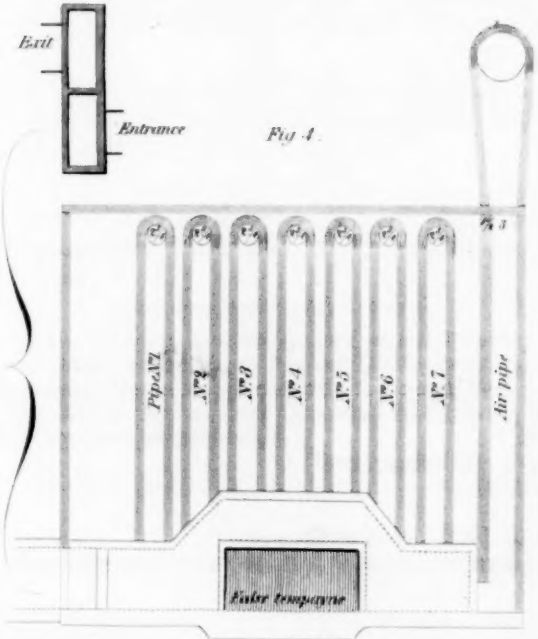


Fig 4.

which the air is conveyed, from the interior of the false tymp, through a series of syphon shaped pipes, into the front chamber of a box, which lies in front of, and parallel to, the false tymp.

This box is divided by a partition into two chambers, an opening at one end of the partition permitting the air received into the front chamber from the pipes, to pass behind into the other; from this it issues through a large pipe, which curves round the angle of the furnace, and conveys the air to the tuyere.

The dimensions of the several parts may be seen in the figure, 3.

Fig. 4 represents a front view of the anterior box, and the air pipes, seven in number, which connect it with the false tymp in the rear. The doorway in the middle of this front box is designed to permit the flame and heated air which play up near the dam stone, to pass between and envelope the pipes, previous to escaping under the sow.

The whole is of cast-iron, the lower part of the walls of the hollow false tymp being at least four inches thick.

In the pipe which leads the air, heated by traversing the tymp, the tubes, and the two chambers of the front box, from the latter to the tuyere of the furnace, there will be a contrivance placed to receive a mercurial thermometer. It will consist of a tube of copper, of about one inch diameter, and six inches length, closed at one end, and the closed end inserted three or four inches through the side of the pipe, so as to expose it to the current of heated air which passes along the pipe, and which will impart its own temperature to it. This tube will be filled to a small height with quicksilver, and the thermometer bulb made to dip into the mercury. The scale of the thermometer will, of course, project out of the tube, that the temperature recorded upon it may be seen.

Mr. Henry intends keeping a daily register of temperature of the blast, and the state of the furnace. Such a register will be highly interesting, and we wish every success to the ingenuity of the liberal and enterprising masters of the Oxford Furnace.

On the Transport of Heavy Burthens upon Ice. By Thomas Jefferson Cram, Prin. Assist. Prof. of Nat. and Exp. Philos., U. S. Mil. Acad.

TO THE COMMITTEE ON PUBLICATIONS.

Gentlemen,—Having seen an account of the following experiments on the resistance of ice, by Assistant Professor Cram, I deemed it of sufficient interest to your readers to request from him permission to publish it. He has kindly furnished the following abstract, which is transmitted for publication.

Very respectfully, yours,
A. D. Bache.

West Point, Oct. 7th, 1835.

Dear Sir,—For ordnance purposes, it became necessary, on the

13th of January, 1835, to transport a heavy piece of artillery (an iron 24 pounder) across the Hudson, from West Point, to Cold Spring Foundry. To ensure safety, two ox sleds were connected, one after the other, and upon which two timbers were longitudinally placed and secured; between these timbers, the gun, previously dismounted from its carriage, was swung, by resting its trunnions upon them, at such points that the whole pressure was distributed, as uniformly as possible, upon the ice which sustained it. A pair of horses were attached to another sled, which was connected with the foremost of those before named, by a rope about thirty feet in length.

The ice over which the gun was taken, had been chiefly formed during that intensely cold week, (in January, 1835,) when the mercury in Fahrenheit's thermometer ranged, here, between $-2\frac{1}{2}$ and -15. The effects of the pressure upon the ice were carefully observed, by myself, along the entire route, and were such as to induce the belief that an idea of its strength could be formed with sufficient certainty to be of practical utility, in all cases where the safety of transporting any load upon ice might be jeoparded.

The ice was drilled through, and its thickness measured, to a tenth of an inch, at intervals of two hundred paces and less, along the whole extent of the track. From the place of departure, to the channel of the river, the thickness diminished from 16.5 in. down to 8 in., and no signs of cracking or bending were observed in the ice—the horses going at the rate of about four miles an hour Across the channel, the thickness increased from eight inches to twelve inches, and no evidence of breaking or bending was exhibited,—the load moving with a speed of about eight miles an hour. From the west edge of Cold Spring flats, to the vicinity of the entrance of a creek, the thickness varied from 12 in. up to 15.5 in., and no indications of yielding were perceived, the horses going at a gentle trot. Near the entrance of the creek, for an extent of fifty paces, the average thickness of the ice was only 5.56 in., and it was covered with a sheet of snow water, two inches in depth. This fifty paces of ice was observed to bend so much under the gun, that I was very apprehensive of its breaking; indeed, had the load been stopped for a few seconds only, it undoubtedly would have gone to the bottom. The depression along here was at least two inches, and the flexure of the ice under the foremost of the sleds, bearing the gun, was less than that under the hindmost, owing to its being weakened by the former, ere the latter came upon it. On crossing this weak spot, the horses had become so much fatigued, and the resistance increasing, by being drawn up the inclined surface of the bending ice, that, with much whipping and shouting, they were barely urged to drag the gun safely over, at a velocity of about four miles an hour.

To determine the pressure sustained by a given superficies of the ice under consideration, it is to be remarked, 1st, That, from the dimensions of the bottom surfaces of the four sled runners under the gun, the whole surface of ice in contact with these bottom surfaces, at the same time, was 6458 square feet. 2d. That the weight of the gun is marked 5579 lbs., and the sleds supporting it, together with

the timbers, lashing chains, wedges, blocks, &c., weighed, in all, 1624 lbs., one sled weighing as much as the other. 3d. That the horses and their sled were so far in advance, the pressure arising from this cause may be neglected, inasmuch as it did not act at the same time, and upon the same ice, with that arising from the gun.

Therefore, the whole pressure sustained by the 6.458 sq. feet of ice, at the same time, was equal to 5579 + 1624 lbs., or equal to 7203 lbs.; and admitting, what was very nearly the truth, that the pressure was distributed uniformly, and dividing 7203 by 6.458, we shall have, 1115.361 lbs., for the pressure sustained by each square foot; at all events, 1115.361 lbs. will be the *average* pressure sustained by a square foot of the ice.

From the observed effects upon the fifty paces of ice at the entrance of the creek, one can form a pretty accurate estimate of the *least* thickness upon which we can *safely* bring a pressure (of 1115.361 + 10) equal to 1125 361 lbs., (the ten additional pounds being the allowance for the covering sheet of water.) It is evident that the ice will *not be safe*, if its thickness be not above 5.56 in.

From the foregoing facts, which were obtained with the greatest care, it may be inferred, 1st, That a load may be transported with perfect safety over sound ice, eight inches in thickness, by distributing the entire weight of the system, so that each square foot (in contact with the bottom surfaces of the runners) shall experience a pressure of not more than about 1115 lbs. 2d. That a load *cannot be safely* transported over sound ice, 5.56 in. thick, when the weight is so distributed, that each square foot of surface (in contact with the bottoms of the runners) shall experience a pressure so great as about 1125 lbs.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.*

Facts respecting the Meteoric Phenomena of November 13th, 1834.

Communicated by DENISON OLMSTED, Professor of Natural Philosophy in Yale College.

FOREIGN TESTIMONIES.

1. By the Rev. W. B. Clark, A. M. F. G. S., &c. (England.)

"On the return, in 1834, of the period when the meteors were seen in 1799, 1832, and 1833, (and also in 1831, Amer. Jour., Jan. 1835,) I felt naturally anxious to watch the atmosphere. My health, however, did not allow me to remain up all night, but on rising at 3 o'clock in the morning of Nov. 13th, I saw from my window in fifteen minutes' time, by the watch, *fifteen falling stars*, in the direction of a line from Leo to the star Mirza, in Ursa Major. The night

* In order that our readers may understand the nature of the discussion in relation to meteors in 1834, we append to the following article, which has been transmitted to us for publication, three others, which have not before appeared in this Journal, from a previous number of the American Journal of Science.

COM. PUB.

was cloudless, and the moon so bright, that the constellations could scarcely be seen; but the meteors were very red and brilliant."

Loudon's Mag. of Nat. Hist.

In vol. VIII. of the same journal, Mr. Clark, after having collected various accounts, says: "On the night of the 13th of November, there was a brilliant exhibition of meteors, from 11, P. M., of the 12th, to near daylight of the 13th."

2. From W. H. White, Esq. (England.)

"I have extracted the following observations from my journal, relative to the meteoric appearances on the morning of Nov. 13, 1834, which, I regret, were both accidental, and very limited, owing to the ill state of health I was in at that time. I have kept a journal of atmospheric and meteoric phenomena for some years, with the hope of deducing accurate conclusions on their origin, properties, and effects."

"*Extract.*—Finding myself unable to sleep, I arose at half-past one o'clock this morning, (Nov. 13, 1834.) The moon was shining with such peculiar brilliancy, that I was induced to take a survey of that portion of the heavens which my windows commanded, the north and east. After looking in the direction of Leo and Ursa Major for a few minutes, I observed a few small meteors, perhaps five or six, (I did not note the number;) but they presented nothing unusual in their appearance. I retired from the window about a quarter of an hour; but my interest in a subject at all times so highly gratifying to my mind, induced me to take another survey. I then saw, in the space of half an hour, ten meteors, all of them highly electrical, of a red colour, and very brilliant; they were without trains, or sparks, and most of them between Leo, Virgo, and Ursa Major. In a few minutes, another meteor, of a paler colour than any I had observed before, glided almost perpendicularly towards the earth; this was succeeded by another, of more brilliant appearance, which took a westerly direction. This meteor cast a brilliant blue light, and had a short, or truncated, train, which was of a paler light than the meteor itself, and gradually shaded off into a yellowish red; it appeared, in fact, like a stream of light, which the meteor, in its velocity, left behind. My health would not allow me to pursue these interesting phenomena longer, and I reluctantly retired to bed.—*Loudon's Mag.*

DOMESTIC TESTIMONIES.

From the St. Louis (Missouri) Observer.

"Mr. Editor—It was remarked in the last Observer, that nothing had been heard of the meteors here this year, although they had appeared at the east.

"On the 13th of November, at 5 o'clock in the morning, there was quite a display of meteors, or shooting stars, as they are sometimes improperly called. Happening to be out, at this time, I observed an unusual number of these meteors, and was immediately reminded of the celebrated meteoric display a year ago. I continued to gaze some fifteen or twenty minutes, and during that time saw perhaps

thirty or forty of these shooting bodies. The display was small, compared with that of last year; yet it was sufficient to render it an object of interest. The temperature, the stillness of the atmosphere, and the clearness and serenity of the sky, were very similar to the appearance last year." "L."

Bond county, Ill., Dec. 15, 1834.

2. From Charles B. Goddard, Esq., Zanesville, Ohio.—Addressed to Professor Silliman.

"Dear Sir,—On the morning of the 13th November last, a female servant in my family witnessed a meteoric appearance, similar to that so generally seen at the same period of 1833. It was not so extensive, nor did it endure so long. She communicated this to my wife on that day, and I questioned her respecting it I have no reason to doubt her veracity.—*Zanesville, Aug.* 12, 1835."

3. From Mr. A. K. Wright, member of the Theological Seminary, Andover, Mass.—Addressed to Prof. Olmsted.

"Dear Sir,—It may be interesting to you to know, that the meteoric exhibition was noticed here this year, as well as in other parts of the country.—*Andover, Dec.* 10*th*, 1834."

4. For the observations made at New Haven, and at West Point, see American Journal of Science, for January, 1835.

Remarks.

1. My respected friend, Professor Bache, has collected and published in the last number of this Journal, a long list of testimonies of those who *did not* see the foregoing meteoric exhibition, derived from sentinels at military posts in the United States. The preceding statements show that there were many, on both sides of the water, who *did* see it, as well as the New Haven observers. Sailors are better observers of *celestial* phenomena than soldiers. Stars must fall thick and bright, to surprise the vigilance of a sentinel in time of peace.

2. Whereas, the American Philosophical Society ordered it to be entered on their records, "that no unusual meteoric display was seen at Philadelphia on the 13th November, 1834," it is to be presumed that, with the impartiality expected from learned bodies, they will also record the fact, that such a display *was* seen at various other places, in both hemispheres.

Meteoric Observations made on and about the 13*th of November*, 1834. By A. D. Bache, Professor of Natural Philosophy and Chemistry in the University of Pennsylvania.

TO PROFESSOR SILLIMAN.

Sir,—On Saturday the 5th instant, my notice was drawn to a paragraph which I supposed to be from the pen of our mutual friend, Prof. Olmsted, calling attention to the Zodiacal light then visible for some hours before sunrise, and suggesting a query in regard to its connex-

ion with "Falling stars" and to a change in its appearance on or about the 13th of November. This induced me at once to commence a series of observations, which was continued until the 19th instant, and on the morning of the 13th, the number of observations and their duration were increased.

Having witnessed the remarkable meteoric phenomena of the 13th of November, 1833, and having been engaged during the summer, in conjunction with my friend Mr. Espy, in observing meteors, I felt competent, as far as experience could render me so, to the task which I had undertaken. The conclusions to which my observations have led, and in which I feel entire confidence, are, that *at the city of Philadelphia there occurred on the 13th of November, 1834, no remarkable display of meteors of the kind witnessed in 1833, and that there was probably no similar occurrence on those mornings which were clear just before and after the 13th inst.*

The observations upon which I base these conclusions are as follows:—

Sunday Morning, Nov. 9, 3, A. M. at Holmesburg, 10 miles N. E. from Philadelphia, I observed the Zodiacal light which extended as described (in the paragraph to which I have before referred) from the horizon, in an illy defined, nebulous light. The night was cloudless, and the moon had set. Wind S. W.

Monday Morning, Nov. 10, at Philadelphia. I observed at about 3 A. M. and again at 4 A. M., but there was a haze which obscured the zodiacal light. After the sun rose the sky clouded over. One very brilliant meteor to the west at the time of the second observation.

Tuesday, Nov. 11, was cloudy, and there was rain with the wind at S. W.

Wednesday, Nov. 12, about $3\frac{1}{2}$ A. M., a low stratus occupied the place of the zodiacal light. At $4\frac{1}{2}$ A. M. the sky was clear and the light brilliant, its general appearance as on Sunday. No meteors in S E part of the sky in 15 minutes.

Thursday, Nov. 13, 12*h* 10′ A. M. air 41° Fahr. Dew point $37\frac{1}{2}$°; sky clear. No meteors. Wind N W slight.

1*h* 5′ A. M. at the close of the observation. Air 40°, sky more hazy to W.

2*h* 40′a 2*h* 55′ A. M. Air $38\frac{1}{2}$, dew point 35, sky very clear, no haze. Three meteors in ten minutes looking to S E out of the way of the moon. Moon sets at 3*h* 49′.

3*h* 50′ to 4*h* 10′ A. M. Air 34°. The whole lower air is near to the dew point, and therefore hazy. The zodiacal light is obscured. Seven meteors in fifteen minutes. Moon has set.

5*h* 15′ a 5*h* 30′ A. M. Air 34°, dew point 31°. Twilight has begun. Five faint meteors in half a minute, and then very rare. Three after those five in about fifteen minutes.

The appearance of these five meteors in such rapid succession, impressed me with the idea that an unusual meteoric display might be about to commence or had commenced; the paths of three of these when produced seemed to meet nearly, two of them I could not bring

to the same point with the other three. After waiting some time for other meteors to confirm or refute the impression made as to direction, by those just referred to, a meteor passed considerably to the S of the zenith, its track, when produced, passing very much below the apparent radiant of the first three, and subsequently one to the north of the first three; its track passing also below the same point.

In reviewing the observations of this morning, the only remarkable occurrence of meteors is that noted between 5*h* 15′ A. M. and 5*h* 30′. But this was neither *in degree nor in kind like a portion of the meteoric phenomena noticed in November*, 1833. The lowest estimate which could be made with any probability of accuracy, of the number of meteors falling in half a minute in one third of the heavens, on the 13th of Nov. 1833, so far exceeds the number observed on this occasion, as to admit of no question in regard to the degree; and again, including the five which fell in rapid succession, there were but eight meteors seen in fifteen minutes, a number entirely insignificant when compared with the numbers which fell in that time a year since; and further there was not even a sensible uniformity in their rate of fall, since after those five were seen, but three occurred in fourteen and a half minutes. These meteors were not similar in kind, to those of Nov. 1833, for the paths of two of the five did not meet at what appeared to be the approximate radiant of the other three, and the tracks of two passed very much below this approximate radiant point.

These meteors were similar both in degree and kind to ordinary meteors. In the observations made by Mr. Espy and myself, we noticed frequently that meteors succeeded each other so rapidly that one observer could not *distinctly* trace their courses; sometimes appearing to come from the same point, at others in paths very variously directed. To a circumstance of this kind the five quickly succeeding meteors, two of which had not a common radiant point with the others are to be referred. In regard to the average frequency of eight meteors in fifteen minutes, as shown before half past 5 A. M. our observations made in the summer, and during the early part of the evening, when meteors are comparatively rare, have given six meteors in nine minutes and a half, five in ten minutes, four in ten minutes, &c. And this in about one fifth part of the sky to which we purposely limited our view, whereas on the 13th of Nov. my view was extended over at least one third of the hemisphere.

They were also similar in kind, their paths being in directions which when produced appeared to meet in very different parts of the heavens.

I continue the detail of observations, which are, however, from the generally unfavourable state of the weather, of inferior interest.

At 10 P. M. on the 13th. Air 46°, dew point 35½°. Wind W. Light fleeces over the moon.

Nov. 14th. From about 3*h* 40′ to 4*h* A. M. a haze obscured small stars to about 20° from the horizon, those of 3d and 4th magnitude were however distinctly visible. Moon up. Two meteors in twenty minutes. At 4 o'clock the haze thickened and mottled clouds

(dark cumulus) came over from the west. Wind W faint. At about 8 A. M. began to rain. At 10¼ P. M. Rains, wind W and N W. Air 50°, dew point 45°.

Nov. 15th, 3 A. M. A white and very thick haze obscured the sky. 11 P. M. Snowing, air 24°, dew point 15½°.

Nov. 16th. 3½ A. M. Snowing.

Nov. 17th. 5 A. M. cloudy. At 8½ A. M. Hailing, air 31°, dew point 23½, wind N E.

Nov. 18th, 1½ A. M. Raining.

Nov. 19th. 1½ A. M. Sky clear, moon up, no meteors visible to S E in ten minutes. Horizon clouded. Clouds coming up from N W. 3 A. M. Sky covered with dark cumulus.

The foregoing observations are extracted from my journal, and the comments upon them are introduced for the sake of showing as far as is necessary the train of reasoning which has led to the conclusion stated in the beginning of this note.

It will be interesting to have information on this subject from different quarters of our country as having a direct bearing upon the explanation of the meteoric phenomena of last year.

Meteors on the morning of Nov. 13th, 1834. By Alexander C. Twining, Civil Engineer.

For a few days previous to Nov. 13th, of the present year, I was on the watch for extraordinary phenomena in the atmosphere and sky; without however observing more than this one, that on the morning of Nov. 9th, the zodiacal light was more brilliant in the east, than I remember ever to have seen it before. This was perhaps owing to the great clearness of the atmosphere. I noticed it at twenty minutes before 5 o'clock, A. M., and it extended at that time as high as the nebula in Cancer.

On the morning of the 13th I made observations in the open air, for a part of the time between one and two o'clock. Although I saw in the moonlight, one meteor of considerable brightness, I was satisfied very soon that nothing uncommon was visible at that hour and ceased observing. Again, soon after four o'clock, the moon having set, I took a station out of doors. At that time there was evidently an unusual number of meteors. They appeared, for the most part, lower in altitude than 30°; they might be seen in either quarter of the hemisphere; their colour was reddish, and their apparent magnitude very uniformly about that of the planet Mars. Their flights were generally not more than 8 or 10° in length; but one which passed nearly in my zenith, shot through as much as 20°. They were generally attended with trains of several minutes in breadth. Of these I observed but one that continued as long as three seconds. In the course of twenty-five minutes, as nearly as I could judge, I counted thirty of these meteors; and I estimated, from this time and number, and the portion of the hemisphere which my sight took in, that they were appearing at the rate of four in a minute.

Besides the meteors thus described, there were two or three which evidently formed a part of the assemblage. These were different from the first in their courses, crossing their paths at irregular angles and differing also from them in magnitude and colour, being very minute white points, precisely like the multitude of common shooting stars, without trains. But the meteors first described, which seemed to constitute the peculiarity of the scene, were not only alike in magnitude, brilliancy, and, as a general thing, in the intervals between their appearance, but their flights were evidently directed, like those of the meteors of 1833, from a *fixed point*; and not a single meteor that I saw, except the two or three stragglers mentioned above, deviated from this regimen. There could be no question, also, that this fixed point was in the constellation Leo, and was either in the same spot with the "radiant" of last year, or in the vicinity of it; but as no meteors described their paths very near to the constellation Leo, I was not able to fix the point within several degrees.

I have not formed a decided opinion whether this whole display is to be considered a slight recurrence of the meteoric phenomena of Nov. 13th, 1833, or not. It certainly possessed, on a greatly diminished scale, the same general character. There was, to say the least, upon this latter morning, such a regularity and *unity* in the assemblage of phenomena as, when coupled with the magnitude of the meteors, to give the impression of an uncommon and remarkable display.

The zodiacal light was all the time visible, about as high as the neck of "the Lion," but far less bright than on the morning of the ninth.

West Point, Dec. 2d, 1834.

Zodiacal Light.

My attention was first attracted to the appearance of the Zodiacal Light in the morning sky, on the 11th of October. At that time it presented a pyramidal form, resting its broad base on the horizon, and terminating in a faint indefinite extremity near the Nebula of Cancer.

On the 5th of November, I inserted in one of our daily papers, a brief notice of this light, with the hope of directing the attention of astronomers towards it. In the same article were suggested the queries, "whether this light has any connexion with falling stars, and whether it would sustain any remarkable change on or about the 13th of November?" The "change" contemplated was, that it would about that time pass by the sun, apparently, and become visible in the evening sky after twilight. It continued to be observed in the morning, (but not in the evening) until after the 13th of November. As soon after that time as the absence of the moon permitted observation, namely, on the 19th, the extreme parts of the same luminous pyramid were recognized in the west immediately after twilight; but, owing to the low angle made by the ecliptic with the western horizon at this time, the light was carried so near the horizon in the south-west as to have its distinctness much impaired. It could, however, be traced a little above the two bright stars in the head of Capricornus. From that time to the present, (Dec. 27th,) it has been seen on every

favourable evening, advancing in the order of the signs faster than the sun. On the evening of the 21st December, in a peculiarly favourable state of the atmosphere, it was faintly discernable, from six to seven o'clock, reaching nearly to the equinoctial Colure, and of course almost ninety degrees from the sun, measured on the Ecliptic.

This light has also continued to be visible in the morning sky, although evidently withdrawing itself to the other side of the sun. The presence of the moon at this time prevents observations in the morning; but we hardly expect to see it any more in the east for a few days to come, although possibly after transiently disappearing, it may re-appear in the morning sky.

On the morning of the 13th of November, there was a slight repetition of the *Meteoric Shower*, which presented so remarkable a spectacle on the corresponding morning of 1833. Supposing it probable that such appearances might be seen, I had concerted measures with several of my friends to watch for them. The following extract from the account of our observations, published the next day in the New Haven Daily Herald, will comprise the principal particulars worthy of notice.

"The presence of the moon in an advanced stage, until nearly 4 o'clock in the morning, permitted only the larger and more splendid meteors to be seen: it is fairly to be presumed that many of the smaller and fainter varieties, such indeed as constituted last year much the greater part, were invisible from this cause merely.

The writer was assisted in his observations by Mr. Tutor Loomis, and by one of his pupils, Mr. A. B. Haile, of the Senior Class. On carefully comparing notes, the following appear to be the principal points worthy of notice.

1. The *number* of meteors, though small, compared with last year, was evidently much above the common average. They began to be frequent as early as four minutes past one o'clock, *mean time*, when a fire ball of unusual size and splendor blazed forth in the east as a signal. From this period they were seen to fall at a pretty uniform rate, until the light of day was far advanced. From a quarter past two, until a quarter past five o'clock, we counted, in the eastern view, embracing one-third of the visible heavens, one hundred and fifty-five. Some, meanwhile, fell in the south-west, and a few in the north-west, but the number seen in the eastern hemisphere greatly exceeded that in the western. Were we to estimate the whole number which fell during the night at one thousand, we should probably not exceed the truth. After intervals of several minutes, three or four meteors would frequently make their appearance in rapid succession. In the eastern view, those south of the ecliptic, and those north, were nearly equal in number, being, for a considerable period, as twenty-seven to twenty.

2. The *directions* of the meteors were more remarkable than their number, and afforded more unequivocal evidence of the identity of the phenomenon with that of last year. They appeared, as before, *to radiate from a common centre*, and that centre was again in the constellation *Leo*. In whatever part of the heavens they fell, their

lines of direction, continued, would pass through that point. The attention of Mr. Loomis was particularly directed towards determining the position of the apparent radiant, having taken the bearings of a sufficient number of the lines of direction, and afterwards traced them on the globe. They meet near the Lion's eye, *Declination* 30° 15′, *Right Ascension* 144° 30′. The radiant point is, therefore, a little northward and westward of the place it occupied last year, which was near Gamma Leonis, Decl. 20°, R. A. 150°. This point was not observed to vary in position for at least three hours, thus corresponding to the conclusions which were made out respecting the radiant last year, a circumstance from which it was inferred that the source of the meteors was beyond the influence of the earth's rotation, and, consequently, beyond the atmosphere.

The meteors generally *fell* in the arcs of great circles, extending from the radiant point, but four were observed to *ascend* from it. One, at a quarter before four o'clock, shot from near Procyon, *towards* the radiant; and three were observed, at different times, moving with extreme slowness, horizontally, from west to east, south of Orion, and Canis Major.

3. The *Zodiacal Light*, which we have observed to precede the morning twilight on every favourable morning since the 11th of October, began to be visible as early as four o'clock, and was seen to extend from the horizon upward, terminating near the place from which the meteors emanated."

It will appear from the foregoing statements, that the phenomenon, if identical with that of November 13th, 1833, had nothing of the magnificence of that. Those, however, who have watched our sky for a long period, both before and after the 13th, concur in the testimony that the exhibition of meteors on that morning, in regard to number, brightness, and direction, was altogether peculiar, and more remarkable than any similar occurrence, before or since. We have not heard, however, that any remarkable fall of meteors was observed on that night any where *south* of this place, although the appearances, as observed by Mr. Twining, were extraordinary at West Point, (which is in nearly the same latitude,) and at places *north* of us, as at Andover, in Massachusetts. By the following letter, received since that time, from Mr. A. K. Wright, a member of the Theological Seminary at Andover, we learn, not only that the phenomenon in question was seen at Andover, but that a remarkable shower of meteors was witnessed in Ohio, on the 13th of November, 1831, which carries us back one year farther than any previous accounts. The statement of Mr. Wright is as follows.

"In a letter dated January 25th, 1834, which I received from my father, who is a physician in the state of Ohio, after some remarks respecting the meteoric exhibition in 1833, as observed in this country, and that in 1832, as observed in Arabia, I find a statement for substance as follows: 'In 1831, on the 13th of November, between three and four o'clock, A. M., I noticed an unusual shower of meteors, while on my way to a neighbour's, where I had been called on professional business.' Knowing the care with which my father's

professional journal is kept, I am satisfied there is no room for mistake, in respect to date.

"It may be interesting to you to know, that the meteoric exhibition was noticed here, this year, as well as in other parts of the country."

P. S. *Jan.* 1.—The Zodiacal Light is still faintly visible in the east. In the west, it reaches nearly to the meridian, but is feebler than at this time last year. Indeed, all its exhibitions have been less striking than they were in 1833-4.

D. Olmsted.

On Calcareous Cements. By James Frost, Civil Engineer.

No. II.

Whoever has taken the pains to examine the nature of calcareous cements, is aware that these useful and important articles differ exceedingly from each other in their character, and, consequently, in their value, as applied to particular purposes, although they are all formed, principally, of the same elementary substances. Thus, we have mortars which continue to harden for centuries, and become at length so indurated, as to excite universal admiration; and we are able, also, to form others, by similar combinations, which will become equally solid in a few months. We have mortars that will never harden under water, but which, on the contrary, will be dissolved and carried away by the current, although consisting of materials nearly identical with those which will, in the same situation, and under the same circumstances, become as hard and durable as stone; and, in fact, there is abundant reason to believe, that we now possess the means of forming a plastic mortar, which will soon become an artificial stone, equally durable with any known natural stone, and by means of which we may, with facility, transmit to our late posterity, busts, statues, or monuments, consecrated to the memory of those who may be deemed worthy of such distinction.

Although there have been many speculative attempts, we are not yet in the possession of any satisfactory theory, connecting and accounting for the numerous facts upon the subject, which are well and familiarly known to practical men, and which, as a perfect theory would do, will enable the artist and engineer to wield these elements at his will; but, on the contrary, we find, everywhere, that prejudice has usurped the place of knowledge, giving rise to severe disappointment and loss. In England, in consequence of the writings of Smeaton, and of Parker's discovery of that very valuable and useful article, the *Roman cement*, which ordinarily contains a very considerable portion of oxide of iron, practical men consider this metal as essential to a good cement, or mortar, and are thus induced to employ very largely, for architectural purposes, an article of an odious colour; although, in France, from the experiments and researches of *Vicat*, so copiously detailed in his *Recherches*, and also from the experiments of *M. Berthier*, published in the *Annales de Chimie et de*

Physique, iron is pronounced to be not merely useless, but actually injurious. There are some writers, also, who represent all the good properties of lime as resulting from its decarbonization, its subsequent recovery of carbonic acid, and its consequent return to its original state of limestone. The insufficiency of these theories, however, may be easily proved, for we can readily form cements of compositions, and in situations, the nature and conditions of which entirely contradict these assertions, or opinions.

From a consideration of the fact that some apparently slight variations in the manipulatory part of the process of making and using cements, produce very striking differences in the results, for which no adequate reasons have been given, it is manifestly necessary to re-examine the subject, and this I propose to do. In executing this task, it is my intention to state the results of all that I know respecting it, in a manner so clear and simple, that any person so inclined may, by direct experiment, satisfy himself of the accuracy of my remarks. I have had much experience on the subject, and have no interests, or prejudices, to warp my opinions; nor have I any other object, than, with an honourable and laudable ambition, to contribute my mite to the advancement of useful and practical science. In performing this task, it will be necessary to examine much that has been published on the subject, consisting of an intermixture of truth and error, and these I shall endeavour to separate.

Calcareous cement, taking the term in its full acceptation, includes every cementing compound of which lime is the basis. These substances, however, are susceptible of division into two distinct classes, and it will be convenient thus to separate them; they are the following:

First. Mortars, or those compounds of lime with other bodies, the lime in which slacks on the application of water, with greater or less facility.

Second. Cement, which also has lime for its basis, but so combined chemically with other substances, as to be incapable of slacking, on the application of water.

Lime, in common with most of the other substances used in mortars and cements, is a metallic oxide, its metallic base being denominated calcium. It is a protoxide, consisting of twenty parts of calcium, combined with eight parts of oxygen, in this state it constitutes what we call quick-lime, which still has an affinity for oxygen, and is probly capable of uniting to a double quantity. The other substances with which the lime is combined, are oxides, with different natural, or acquired, capacities for combining with oxygen, which latter agent seems, indeed, to be the connecting link in the chain of affinities.

FRANKLIN INSTITUTE.

Quarterly Meeting.

The forty-seventh quarterly meeting of the Institute was held at their Hall, October 27th, 1835.

Thomas Fletcher, Vice President, in the Chair;

John C. Cresson, Rec. Sec., P. T.

The minutes of the last quarterly meeting were read and approved.

Donations of books were received from George Bruce, Esq., of New York, Gerard Ralston, Esq., of London; William H. Keating, and George W. Smith, Esqs., of Philadelphia.

Donations of minerals were received from Messrs. John C. Trautwine, of Philadelphia, and Joseph George, of Pottsville, Penn.

Donations of models were received from Mr. L. V. Badger, and Messrs. Walker and Badger, of Portsmouth, N. H.

The Corresponding Secretary laid on the table the periodicals received during the past quarter, in exchange for the Journal of the Institute.

The Chairman of the Board of Managers presented the forty-second quarterly report of the Board, which was read, accepted, and referred for publication.

The Treasurer presented his report for the quarter ending Sept. 30th, which was read and accepted.

Mr. S. V. Merrick, from the committee, of the Board of Managers, on the extension of the accommodations of the Institute, presented their report on that subject, accompanied by plans of the new hall. The report was read and accepted, and referred for publication.

On motion, the resolution appended to, and recommended in the report of the Board of Managers, on the new hall, was unanimously adopted.

The architect of the new hall, William Strickland, Esq., explained the drawings, presented to the meeting by the committee.

On motion, the plan for the new hall was unanimously adopted, and the Board of Managers were authorized to take the necessary measures for its execution.

On motion of Wm. H. Keating, Esq., it was

Resolved, That the thanks of the Institute be presented to the President of the Institute, Mr. James Ronaldson, for his liberal donation of five hundred dollars, to aid in the erection of the new hall.

Thomas Fletcher, *Vice President.*

John C. Cresson, *Rec. Sec. P. T.*

Forty-seventh Quarterly Report of the Board of Managers of the Franklin Institute.

In compliance with the requisitions of the constitution, the Board

of Managers offer to their constituents an account of their proceedings during the past quarter.

The exhibition of domestic manufactures by the Institute, held at the commencement of the present month, was entirely successful. The display of articles then exhibited, was such as to excite a thrill of pride in every patriotic bosom. Many of the specimens, offered convincing proof that, in several departments of manufactures, our artisans are not behind those of any part of the world; and all displayed an improvement upon former years, strengthening the belief that, with proper encouragement, the highest state of perfection may be attained in every branch. The Committee on Premiums and Exhibitions are actively engaged in drawing up a report of the exhibition, and in preparing the awards of premiums, &c.; all of which will, in due course, be presented to the Society.

The Committee on Instruction have not been unmindful of their duties. The drawing school has been already opened, and with the encouraging prospect of a much larger class than last year. The committee have now under consideration, plans for increased accommodations for the school. The English evening school will open in a few days, under the care of Mr. Seth Smith; and the Board earnestly recommend this, and also the drawing school, to the patronage of the members of the Institute. If mechanics would offer as a reward to their best apprentices, a quarter's tuition in these schools, it is believed that great benefit would be conferred on the apprentice, without any real expense to the master, who would be more than repaid by the increased industry and attention of his apprentice.

The Committee on Instruction, having given attention to the resolution passed at the last quarterly meeting, on the subject of architectural lectures, have reported that, in their opinion, such a course would not be sustained by a sufficiently large and interested audience, but that they will invite, from competent persons, a few lectures on that branch.

The Library continues to increase, though not so rapidly as the Board could desire; seventy-two volumes have been added during the quarter.

The Journal of the Institute seems to be gaining in favour, and the Committee on Publications have thought themselves justified, by its more extensive circulation, to decide upon enlarging its size, after the present year, so as to increase its usefulness, and render it still more worthy of patronage.

The Committee on Explosions are advancing towards the termination of their labours. Their report of experiments, made at the request of the Treasury Department, is now in the hands of the printer, and will soon be laid before the Society.

The first Monthly Conversation Meeting, for this season, was held in September, and offered, as usual, many attractions.

One of the most important subjects which has engaged the attention of the Board, is the enlargement of the accommodations of the Institute. The committee of the Board, to whom this subject was especially entrusted, have been actively and laboriously engaged in ob-

taining plans for a building, and devising the means for its erection, on the lot in Chesnut street, recently purchased by the Society. The committee have finally reported a plan of a building, and a prospectus for a loan for the payment for the lot, and the erection thereon of the building; all which your Board recommend to the Society for their adoption.

The report of the committee, containing all the details relative to these matters, will be laid before this meeting.

All which is respectfully submitted.

ISAAC HAYS, *Chairman.*

WM. HAMILTON, *Actuary.*

Report of the Committee on the Extension of the Accommodations of the Institute.

The Committee appointed to extend the accommodations of the Institute, by the purchase of the Masonic Hall,

REPORT:

That they have performed the duty with which they were charged, and have made the arrangements preliminary to the transfer of the property. Various delays have occurred, owing to the absence of one of the trustees of the Grand Lodge, whose name was requisite to the execution of the deeds, but they are now ready for signature.

By agreement with the Grand Lodge, the purchase has been made upon the following terms, viz:

15,000 cash, on delivering the title deeds, and giving possession,
20,000 do. on 1st January, 1836,
25,183 33 do. 1st January, 1838,
25,183 33 do. 1st January, 1840,
25,183 34 do. 1st January, 1842.

110,550 dollars.

The last three instalments to remain subject to interest, at the rate of 5 per cent. per annum.

On the execution of the title deeds, the Institute will be in possession of a property daily increasing in value, and admirably calculated, if judiciously improved, to enable the Society to extend its beneficial influence to the widest limits, and especially to foster that important interest, the mechanic arts.

The Committee, in conjunction with William Strickland, Esq., architect, have devoted much time in devising a plan for a building, which shall yield a fair interest upon its cost, and, at the same time, afford ample accommodations for the lectures, exhibitions, schools, reading room, and other purposes of the Institute.

The result of their labours is now presented in the design prepared by Mr. Strickland.

It will be perceived by an examination of these plans, that while the principal front upon Chesnut street has been designed in a man-

ner which shall reflect no discredit upon the good taste of the members, the committee have not ventured upon an extravagant expenditure on mere ornament, of funds which may be more appropriately devoted to the improvement of the rising generation, but have studied neatness and simplicity in the architecture, and have endeavoured to make the whole building a substantial and useful structure.

The portions of the building devoted, in the main, to revenue, are,—

1st. Four commodious stores, fronting upon Chesnut street, 18½ feet wide, by 60 feet deep.

2d. One spacious room above the stores, with an entrance from Chesnut street, in the centre of the building, 100 feet long, 60 feet wide, and 30 feet high to the cornice, to be used as the exhibition room of the Institute, and to be rented for similar purposes.

3d. In the centre of the lot, to be used also as an exhibition room, a hall 72 feet long, by 30 feet in width, having an entrance from Chesnut street, 19 feet wide.

4th. Five stores, or shops, upon Lodge street, suitable for mechanics' shops of various descriptions, each 16 feet wide, by 40 feet deep.

5th. The third story over the lecture room, on Lodge street, the whole size of the building, 60 feet by 100 feet, to be divided into suitable apartments.

For the accommodation of the Institute, the Committee have provided the following rooms, from which they will also derive some revenue.

1st. Two rooms upon the second floor of the centre building, each 30 feet wide, by 32 feet long, divided by a passage to the lecture room, to be occupied as the reading room and library, the cabinet, managers' room, and room for meetings; and two rooms on the third and fourth stories, 30 feet wide, by 72 feet long, to be used as model rooms, and for other purposes.

2d. One lecture room upon Lodge street, above the lower range of shops, 60 feet wide, by 100 feet long, capable of seating 1200 persons.

In reference to the unusual size of this room, it may be proper to state, that the Committee, considering the flourishing state of the institution, and the demand so often reiterated by the members for extended accommodation, have deemed it advisable to devote a large space to this object, and have made the room as large as can be easily filled by the voice of the lecturer.

The present lecture room of the Institute will contain about 500 persons; during the last season, the number of ladies' and minors' tickets issued was 478, thus excluding nearly all the members, now exceeding 1800, and their number rapidly increasing, from a participation of that instruction, which they have a right to claim. To meet the wants of the members, a room of the size provided is deemed indispensable.

3d. In addition, are provided four rooms; two under the elevated seats at the back of the lecture room, and two under them, on the

ground floor, 20 feet wide, by 40 feet long; these may be appropriated to the schools of the Institute, which are daily becoming more important, from their connection with its best interests.

4th. There are two smaller rooms, for the apparatus room, and laboratory of the lecturers.

Having thus laid before the meeting the general outline of the proposed plan, an estimate of the cost, and sources of revenue to enable the Institute to meet all demands for interest, without having recourse to its ordinary resources, will now be considered.

1st. The whole cost of the new building to be erected upon the Chesnut street front, and the alterations required in the Masonic Hall, as it now stands, to adapt it to the proposed plan, together with the purchase money to be paid for the property, has been estimated by Mr. Strickland, at $175,000

From this sum must be deducted the remaining three instalments due the Grand Lodge, in January, 1838, 1840, and 1842, at 5 per cent. interest, 75,550

Leaving the sum of $99,450

To be provided for by the Institute.

To meet this expenditure, the Committee propose to raise, by loan, the sum of $100,000, and to issue transferable certificates of stock, bearing interest at the rate of six per cent. per annum, irredeemable without the consent of the holders, previous to the year 1856, and for the security of the stockholders, to transfer the title on the property to trustees, and pledge for the payment of the interest, the faith of the Institute, together with all the revenues derived from the property when improved, and all money received from life memberships, donations, or bequests, not otherwise specially appropriated by the donors, and all money arising from the sale of ladies' and minors' tickets, to which may be added, the present available sinking fund of the Institute.

That this loan will be promptly taken, the Committee have not a doubt. Independently of the positive security offered in the property itself, upon which the whole amount will be expended, the stockholders will have additional security in the faith of a large and permanently established institution, embracing upwards of 1800 members, the value of which is now too justly appreciated for it ever to be allowed to languish.

The revenues applicable to the payment of interest, and gradual reduction of the debt, are estimated as follows:

1st. The hall now occupied by the Institute is its own property, subject to the interest accruing upon the former loan. All the receipts from it, therefore, are applicable to the reduction of the new debt, after satisfying the old claimants.

With a full knowledge of the value of this property, the Committee

estimate the rents available from it, after the Institute have ceased to occupy the parts of it now used by them, at $2200
To this may be added, as annual appropriations, all monies received from the sale of ladies' and minors' tickets, and life memberships, 1000
And interest on the present sinking fund, 625

Making a total of $3825
From which must be deducted, interest due to the old stockholders, 1218

Leaving available, $2607

From the New Building.

Rents of four stores on Chesnut street,		$4000
Rent of a large exhibition room, including rent now paid at the exhibitions of the Institute,		2500
Rent of the large room in the centre of the building,		1000
Rent of the five shops on Lodge street,		750
Rent of the third story room on do.		300
Rent of the large lecture room, when not used by the Institute,		1000
		$ 12,157
Deduct 6 per cent. upon loan of 100,000 dollars,	$6,000	
Do. 5 per cent. upon debt due to the Grand Lodge, of $75,550,	3,777	9,777
Leaving the sum of		$ 2,380

To accumulate as a sinking fund, for the final redemption of the debt.

The sinking fund of the Institute now amounts to $12,500, which may also be added.

The Committee recommend the adoption of the following resolutions:

Resolved, That the Board of Managers be, and are hereby, authorized to borrow the sum of one hundred thousand dollars, upon the terms set forth in the subjoined proposal, to be appropriated exclusively to the payment of the first two instalments of the Grand Lodge of Pennsylvania, of the purchase money due for the hall in Chesnut street, and the improvements thereon.

Resolved, That for the payment of the interest, and the repayment of the principal, the faith of the Institute, together with all revenues derived from the property purchased,—from the present property of the Institute, after satisfying the claims of the old stockholders, and all revenues derived from life memberships, and the sale of ladies' and minors' tickets to the lectures of the Institute, and all legacies, or bequests, and donations, not otherwise specially appropriated by

the donors, be and are hereby pledged for the payment of the interest, and the final liquidation of the debt.

All of which is submitted.

SAMUEL V. MERRICK,
FREDERICK FRALEY,
ALEX. DALLAS BACHE,
ALEXANDER FERGUSON,
WILLIAM H. KEATING,
JOHN STRUTHERS,
ISAAC HAYS, M. D.
MATTHIAS W. BALDWIN,
THOMAS FLETCHER,
} *Committee.*

Adopted by the Board of Managers, at a meeting held Oct. 28, 1835, and ordered to be submitted to the Institute.

ISAAC HAYS, *Chairman.*

WILLIAM HAMILTON, *Actuary.*

Monthly Conversation Meeting.

The second conversation meeting of the Institute, for the season, was held at their Hall, October 22d, 1835.

Mr. Isaiah Lukens exhibited an arrangement for a mercurial horizon, which was much admired for its neatness, compactness, and convenience.

Mr. Samuel V. Merrick exhibited and explained the operation of a gas-meter, such as will be used in the distribution of gas in this city.

Mr. R. Cornelius presented two branches for gas burners, of graceful form, and neatly ornamented, one of which was provided with an apparatus for collecting and carrying off the water generated by the combustion of the gas. The same gentleman exhibited a contrivance intended as a substitute for a waste cock to hydrants. This arrangement will be described in the next number of the Journal.

A wardrobe lock, which was opened by a key so small as to be contained in a common finger ring, was exhibited by Mr. Pretzman. The mechanism was much admired.

From Messrs. Carr & Lunt were received, 1st, a model of a hollow forge back for heated air, invented by Walker & Badger, Portsmouth, N. H. This is intended to be applied to the common smiths' forge, to supply a hot air blast from the heat usually expended in burning out the forge back. 2d. The model of a cupola furnace, intended for the use of the heated air blast, a patent for which has been taken.

Mr. D. Stevens laid before the meeting, the diploma of membership in the Institute, printed in colours,—a beautiful specimen of the art.

The model of a four oared barge, constructed by Mr. George James, of Philadelphia, and awarded to the Cleopatra Barge Club, was upon the table, and was much admired.

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED IN MAY, 1835,

With Remarks and Exemplifications, by the Editor.

1. For a *Washing and Wringing Machine;* John Snyder, City of New York, May 2.

The articles to be washed are laid upon a fluted concave segment board, contained in a trough, which segment board is borne up by spiral springs placed under it. A vibrating frame above the segment board carries a fluted roller, between which and the board the clothes are squeezed. Instead of fluting the board it is sometimes furnished with rows of small rollers turning on gudgeons, and the vibrating frame, instead of a roller, carries a fluted block. The wringing is to be effected by passing the wet clothes between two rollers borne against each other, the rollers being covered with blanketing, flannel, felting, or canvass.

The claim is to "the application of the spiral springs below, and the spring bars above, the articles intended to be operated on, whereby the operation of the roller and segment board, or convex fluted board and rollers beneath, will be powerful in proportion to the thickness, or magnitude, of the articles to be operated on between them. And I claim as my invention the combination and arrangement of the several parts, and methods, as herein substantially specified and set forth, and as the same operate for the purposes intended by me, and which said arrangement and combination constitutes my invention of certain new and useful improvements in machinery adapted to wash and wring personal and domestic linen, cotton, or other similar articles."

Washing machines, substantially the same with the foregoing, operating like it, by a vibrating frame and concave segment, furnished with flutes, rollers, and springs, have been the subject of more than one patent, and this, certainly, is an essential feature of the combination before us, or it has not any essential feature.

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2. For a *Truss* for Hernia; Philip Hittell, city of Philadelphia, May 2.

This is denominated "the improved common convex truss." The pad is to be made of wood, or other hard substance, and is to bear equally upon the ruptured and unruptured sides, being carved in such a form as to enable it to do so; and to adapt it the more perfectly to the parts, it is to be divided vertically, in the centre, and the two parts united by a hinge, or spring. It is assumed by the patentee that if pressure is made on one side only, this pressure tends to rupture the opposite side, an opinion not at all sustained by experience, or founded in reason. Trusses with double pads are well known to surgeons, and have been frequently worn where the actual disease was on one side only, and the patient was believed to be predisposed to rupture. A claim is made to "the principle of

equal pressure of the convex pad, carved or cast on a plate of any material whatever, united in the centre by a hinge, thereby making equal pressure," &c.

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3. For a *Machine for cutting Straw and shelling Corn;* William Denson, Centre Springs, Morgan county, Alabama, May 2.

The claim made is to "the combination of a straw cutter and corn sheller in the same machine;" a claim which we think altogether untenable. Will any one say that a patent can be sustained for spinning cotton and grinding scythes, by the power of the same steam engine? Yet a negative answer to this question, would condemn the patent before us, in which there is no pretence to invention; a straw cutter, and a corn sheller, are driven from the same shaft, this is all that is pretended.

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4. For an improved *Frame for Rail-road Cars, and other Carriages;* Heinrich Bachmann, Lancaster, Pennsylvania; an alien who has resided two years in the United States: May 2.

We are informed that by the plan here proposed Rail-road Cars may turn the small curves necessary in leaving the track for a warehouse, a yard, &c.; and that the lateral friction on the rails will be no greater upon any curve than on a straight line. We wish that this was true, but, unfortunately, the theory of the patentee is incorrect, and the plan by which he proposes to produce this useful effect is without novelty, its essential principle being well known, and repeatedly patented. The plan for causing the fore and hind wheels to adapt themselves to a curve, simultaneously, is the same with that upon which we remarked at p. 249, when speaking of Mr. Herron's patent, and to which, in order to avoid needless repetition, we must refer the reader. As regards the correctness of the theory, let it be remembered that when the fore wheels of a car pass from a straight road on to a curve, the hind wheels are still upon the former, and that by the plan proposed they are adapted to a curve at which they have not yet arrived, and will, therefore, have to grind their way to it. The patentee proposes to place the hind and fore wheels ten feet apart, which will greatly augment the evil that he imagines he has removed.

As in turning curves the opposite wheels must move with different velocities, the patentee uses a separate axle to each wheel, thus admitting of this difference of motion; there is no more novelty in this than in the other parts of the plan. Separate axles have been repeatedly used; and the same effect was produced, many years since, by leaving one wheel on each axle loose, so that, when necessary, it could turn upon it in the ordinary way.

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5. For a *Washing Machine;* Philo Hunt, Sharon, Litchfield county, Connecticut, May 2.

Two grooved cylinders are to cross a trough near its upper edge,

one of which cylinders is to be borne up against the other by springs; between these the clothes are to be passed by the turning of a winch. A washing machine, identical with this, was described by us two or three years ago; we could easily give day and date, but do not think it necessary to turn to the book on the present occasion.

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6. For a machine for *Cutting Bungs, &c.;* George D. Gates, Hartford, Connecticut, May 2.

A shaft is to revolve vertically, having a collar like a lathe mandrel; this is to carry steel cutters fixed in an iron hub, or chuck, and the timber from which the bungs are to be cut, is placed beneath it on a bench made to slide up against the cutters. The claim is to "the application, by pressure, of a piece of board, or timber, against revolving cutters, until the same is cut through."

Round pieces of wood, from the size of button moulds to articles of a much greater diameter, have been cut by *pressure against revolving cutters*, time out of mind, yet it is the doing this, and not the machinery by which it is effected, that forms the claim.

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7. For a *Printing Apparatus;* Josiah Warren, Warwick, Tuscarowas county, Ohio, May 2.

The object of this invention, we are informed, " is to simplify and cheapen the printing power so as to adopt it to the condition and capacities of *private citizens.*"

We do not think that the inventor has succeeded in his object, either for "private citizens," or for *public characters*, as his "simplified printing apparatus" is much more complex than others which have been before made for the same purpose. For " private citizens" we should prefer the old fashioned balls to the inking rollers, and the making register by means of the frisket to the plan now proposed. The description of the machinery, as given by the patentee, is much involved, and we shall not attempt to clear it up; the claim also is indefinite, being to " the above described apparatus for inking, registering, or placing the sheet, and giving the impression in printing. Particularly the arrangement and combination of the parts, and their application to commodious or ornamental articles."

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8. For a *Water Wheel;* Thomas Pierce, Hartwick, Otsego county, New York, May 2.

This is called " an inclined water wheel, and a horizontal rotary wheel for propelling the same." The water from the head is to descend through a vertical flume, or trunk, from the lower end of which there is a horizontal duct leading to the horizontal wheel, and striking its periphery, which is furnished with oblique floats or buckets, and is contained within a curb. A second trunk or flume ascends from the former to the surface of the water in the tail race, the wheel being represented as placed at a considerable depth. The shaft of the wheel, by which machinery is to be driven, rises through this last trunk. All this we think a very bad arrangement, but if

the patentee can effect what he proposes, he will more than make up for any trifling defect, as, when there is a fall of thirty feet, for example, he proposes to place three such wheels in succession, each of them to have the full pressure of twenty feet, and thus to "gain power." As his reasoning upon this subject is contrary to all reason, and occupies more space than we have to spare, we shall postpone the further consideration of the affair until some new laws of nature are enacted.

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9. For *Cutting Comb Teeth;* Samuel Adams, Redding, Fairfield county, Connecticut, May 2.

An apparatus is described by means of which the teeth of combs are to be cut by applying power, instead of manual labour. The apparatus presented we can understand, so far as it goes, but as the mode of applying it to the cutting of comb teeth, or of any thing else, does not appear, we are really in the dark upon the main point, and, therefore, have nothing to communicate.

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10. For a *Machine for Stiffening Hat Bodies;* Henry Blynn, Newark, Essex county, New Jersey, May 9.

Two wooden rollers, two feet three inches long, and four inches in diameter, are placed horizontally, and geared so as to revolve together over a trough containing the stiffening; this trough has a partition dividing it into two parts, and has in it two kinds of stiffening, one adapted to the crown, the other to the brim. The crown is saturated by immersing it in the proper compartment, and then passed up between the rollers to equalize the stiffening, and to squeeze out that which is superfluous, after which the brim is similarly treated. The drippings are in each case, conducted back into the proper compartment. It is said that "in this way the stiffening is much more equally distributed through the hat than it can be done in the usual way by hand, and in much less time."

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11. For a *Churn;* Michael Knight, Pownall, Cumberland county, Maine, May 3.

This is a double dasher churn, the levers, and other appendages for working the dashers, being constructed in such a manner as to be adjustable, as will appear from the following claim:

"I claim as my invention the wheel, with the power it gives to lengthen and shorten the sweep; the bars connecting the sweeps which give to the machine a steady motion; and also the construction of the dashers, by which I can lengthen and shorten them so as to conform to the quantity of cream to be churned."

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12. For *Throwing and Twisting Silk;* Lucilius H. Moseley, Poughkeepsie, New York, May 9.

(See specification.)

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13. For a *Washing Machine, and Churn;* John B. Mitchell,

and Sylvanus Fairbanks, Roadfield, Kennebec county, Maine, May 9.

All that we shall offer respecting this machine, are the claims, which are the following.

"Claims. 1st. The application of cams for pushing, or putting into operation, stocks for washing machines, fulling mills, tanners' mills, for softening hides, churns, &c.

"2nd. The application of the fluted wash board to the lids of the washing machine."

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14. For a *Machine for sifting and cooling Grain and Berries;* Martin N. Armstrong, and William H. King, City of New York, May 9.

Two wire screens, an inner and an outer, are placed concentrically, and revolve upon horizontal axles. The grain, &c. to be cooled or sifted, is admitted between the two cylinders by a door extending along the outer cylinder. Within the inner cylinder there is a revolving fan, and another below the outer cylinder, which conjointly blow upon the article contained between the two screens.

The description is extremely verbose, partaking largely of "the said" and "aforesaid" style of a special pleader; we should have been spared much trouble had the specification been sifted, or winnowed, and the grain only deposited in the patent office. The driving machinery consist of bands and wheels, and possesses no novelty. We give the claim.

"And we, the said Martin N. Armstrong, and William H. King, do say and claim, that we are the joint and original inventors of the machinery hereinbefore described and set forth, for the purposes hereinbefore set forth, except only that the said cylinder hereinbefore described, hath been heretofore known and patented, without the opening or sliding cover hereinbefore mentioned and described, but with openings in the ends or extremities thereof; and except also that fans, frames, cases, pulleys, shafts, cranks, hoppers, connecting straps, or other component parts of the said machinery, hereinbefore described and set forth, may have heretofore been used separately; but we say and claim, that we are the joint and original inventors of the combination and uses of the said component parts, for the purposes aforesaid, as hereinbefore described and set forth."

It may be worth, enquiry whether "the said cylinder" which "hath been heretofore known and patented," but with openings at the ends instead of on one side, if not free to be used by the patentee, would become so by merely changing the place of opening.

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15. For a *Spring Fleam for Bleeding Cattle;* Cornelius Adle, Winthrop, Kennebec county, Maine, May 9.

The cutting part of this instrument is a separate piece, which is made to fit into a mortice on the end of a straight spring, where it is confined by a screw, by which its length may be regulated. The body of the instrument is a flat bar, or blade, with a handle, resem-

bling a spatula. A mortice, or slot, is made through this, to allow the point of the fleam to pass through; the straight spring is fastened on one side of this blade, and is held up by a trigger, upon withdrawing which the fleam is forced down through the slot, which is placed immediately over the vein.

"What I claim as my invention, is the construction of the instrument, and the manner in which the fleam is gaged, set, and propelled, or driven, into the subject operated upon."

For some remarks upon spring lancets, with a guard, see vol. ii., p. 235.

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16. For a *Washing Machine;* Jacob Sager, Harrisonburg, Rockingham county, Virginia, May 9.

The clothes to be washed are placed within a revolving cylinder, the circumference of which is formed of round bars standing at a suitable distance apart; the revolving cylinder is contained within a tight barrel, or case. The clothes are to be hung round certain bars in the cylinder, which bars are placed somewhat nearer the centre than the others. There are other bars passing from head to head, say at four equidistant points, to increase the agitation, and what the patentee calls swing gates, to prevent the clothes from falling through between the bars. We do not perceive any thing in this washing machine to protect it from the fate of the thousand and one instruments for the same purpose which have seen their day, and have ascended, or descended, into the lumber room, or the cellar. We shall not offer any further particulars.

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17. For a *Cooking Stove;* William Resor, H. B. Wade, and R. P .Resor, Cincinnati, Ohio, May 9.

This is called a double reflecting cooking stove. The body of it is to be a metallic box, which is to stand upon four legs: its appearance in the drawing very nearly resembles that of a double desk, the two sloping sides being hinged in the same manner. in order to give access to the interior; the form of the bottom is the same with that of the top, two of its sides being made to slope in the same manner, for the purpose of reflecting the heat upon the articles to be cooked. The fire place passes along the middle of the box, occupying the space which would be under the horizontal part in a double desk. This horizontal part is open, for the purpose of admitting pans, kettles, &c. to stand over the fire, and from it also ascends the smoke flue. The box, or stove, which contains the fire, is made to lift out, together with its grate, ash pit, &c.

Along one of the chambers of the box, there is a spit, and into the other may be put articles to be baked, &c.

The claim made is to the particular arrangement and construction of this stove, for cooking by reflected heat, but not to the cooking by reflection, excepting in an apparatus constructed like that described.

18. For a *Thrashing Machine;* Stapleton C. Sneed and Wm. B. Carpenter, Albemarle county, Virginia, May 9.

The manner of fastening the spikes into the wood of the cylinder and concave appears to be the thing which these patentees suppose to be an improvement, although they have not said so distinctly, or made any claim; but in all other points this machine is like a hundred others.

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19. For an improvement in the *Damask Loom;* Patrick M. Gilroy, Warwick, and Abner S. Tompkins, North Providence, Rhode Island, May 9.

This improvement in the damask loom consists in the application of water, or other, power to drive it. The general arrangements by which this is effected resemble those of the ordinary loom, but, of course, so varied as to adapt them to the purpose in hand; the treadles are worked by cams, just in the same way, and one also is used for operating upon the cylinder, or apparatus, by which the pattern is given; or a perpendicular lever with a pulley on it, for the large cam to bear on, may be used. In either case, the large cam is connected with the back harness by means of levers and rods, and weights to govern them.

The claim is to "the combination of machinery constituting the application of power to drive the damask loom, and particularly the large cam, and large treadle; or the lever and pulley as a substitute, and the two small cams on each end of the bottom shaft."

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20. For a *Diving Apparatus;* John W. Fraser, Boston, Massachusetts, May 9.

From some cause, the patent above named has not actually issued, although it is entered upon the list; we must, therefore, delay our notice of it until it has passed the seal.

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21. For a *Saddle Seat Spring;* Marshal Baylis and William Brannon, Fredericksburg, Spottsylvania county, Virginia, May 16.

A thin box, or case, is made of such length and width as will allow it to be contained within the seat of a saddle; this case is open at one end, and within it is inserted a steel spring, which is bent backward and forward, in a zig zag form, and extends nearly the whole length and width of the case. This spring is so placed within the case, that the webbing of the seat is strained from the pummel of the saddle to one side of an iron rod which surrounds the spring, and projects out at the back end of the case, so that the weight of the rider will cause a pressure upon the zig zag spring. The claim is to "the combination and arrangement, consisting of the serpentine or waved spring; the manner of securing it down, by means of the bent ends of the rod, and the case, as described, to contain these parts."

22. For a *Stove for Warming Rooms;* Charles W. Peckham, New Haven, Connecticut, May 16.

This is called a *reverberating stove*, and it is so called because the draught from the fire may be made to descend between plates on one side of the stove, to its lower end, or base, and then to ascend between plates on the opposite side, leading to the smoke pipe. When the fire is first lighted, the draught to the pipe is direct; but after the ignition is perfect, a valve closes this opening, and the reverberation necessarily takes place. The following are the claims.

"I claim as my invention and improvement, the shape and construction of the base, and its connexion with the body of the stove, as above described, by means of which the whole of the fumes may be made to pass through its extensive chamber, without interruption, diffusing heat from all parts of it.

"I also claim as my invention and improvement, the shape and construction of the body of the stove, as above described, by means of which the reverberation of the fumes is carried round the stove in flat pipes, or conductors, thereby exposing more surface for the diffusion of the heat than could be obtained from round ones containing the same matter."

So far as reverberation, and the consequent diffusion of the heat from the lower as well as from the upper part of the stove, are concerned, the analogy between this and Spoor's stove is complete; the alteration of the draft from direct to circuitous, is also perfectly similar; the aim and the means in both we think substantially identical. We refer the reader to p. 200 of vol. xiv., and to p. 81 of the present volume, for our notice of Spoor's stove, as originally described and claimed, and also as described and claimed in an amended specification.

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23. For a mode of *Making Hats, Caps, &c., and Stiffeners for Neck Stocks;* Elisha Pratt, Cambridgeport, Middlesex county, Massachusetts, May 16.

This patent is taken for giving a coating, to the articles named, of a composition in which India rubber is the principal ingredient. The articles combined are to be placed in a *friction mill*, "which mill," says the patentee, "I claim as my invention," and a particular description is given of it, but no drawing is furnished, a circumstance which, we apprehend, would invalidate the patent, as it is a neglect of a special and absolute requirement of the law.

The friction mill is a pot, or vessel, of iron, or other material, in which a vertical shaft revolves, and carries knives, which pass between others fixed in the vessel, in the manner of a pug mill. The following ingredients, in the proportions named, are to be put into this vessel,—100 lbs. India rubber, 5 lbs. sp. turpentine, 8 lbs. asphaltum, 2 lbs. spermaceti, 1 lb. pearlash, 4 lbs. litharge, and an equal quantity of Vandyke brown, and sugar of lead. These are to be acted upon by the mill, until they are perfectly incorporated. We are

told, however, that much art and care are requisite in the process, and much judgment required in proportioning the ingredients.

Although these several substances are named, it appears that the useful effect depends upon the India rubber, as we are informed that this compositton "will *lubricate* (?) freely, when applied to the uses hereinbefore mentioned, and form a thin coating, which will adhere firmly to the substances to which it is applied, and will harden and become tough on exposure to the atmosphere, when, in fact, from the evaporation of most of the several materials used in said composition, the rubber is restored to its natural state, or a state nearly resembling it." In the olden time, every one of the articles used, with the exception of the spirits of turpentine, would have refused to evaporate, and that with the most persevering obstinacy, even at a high temperature. If, by remaining behind, they really improve the water proof stiffening, it is well that they do not fly off, as supposed; we do not, however, believe that this composition will be superior to others which have been made, by combining the solution of India rubber with colouring matter, and with earthy and other ingredients.

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24. For a *Water Wheel;* William Merrell, Randolph, Portage county, Ohio, May 16.

This is a reaction wheel, but certainly not an improvement on some previously in use. The water is to enter on the upper surface of the wheel, and to flow out at the periphery; but it appears that it passes into the spaces between each of the curved buckets, through separate openings, there being a solid hub of two feet diameter in the centre. There is no claim.

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25. For a *Machine for Hulling Cotton Seed, &c.;* James Martin, Petersburg, Dinwiddie county, Virginia, May 16.

This machine operates by means of stones, running like mill stones, but furrowed in a way particularly described in the specification. These stones are made adjustable, and may, when desired, be used for grinding corn, by causing them to approach each other sufficiently near for that purpose. The hulled seed falls into a circular trough, that surrounds the lower stone, to which a brush is attached, which, sweeping round the trough, carries the seeds and hulls round to a spout through which they fall, and are carried to be riddled and cleaned.

The claims are to the combination of the respective parts by which they are adapted to the purpose set forth; to the manner of feeding by pins, set spirally on a vertical revolving rod; and to the circular trough and brush, or brushes, for collecting the seed in the manner described.

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26. For an improvement in the *Manufacture of Salt by Solar Evaporation;* Edward C. Cooper, city of New York, May 16.

An inclined plane is to be formed by properly preparing the ground, and covering it with a coating of hydraulic cement, and

down this plane the water to be evaporated is to run, there being proper receptacles for it at the bottom. To cause it to be distributed properly over the plane, the latter is to be covered with gravel to the depth of one-fourth of an inch. The water is to be pumped into a reservoir at the head of the plane, and from this it flows into a regulating tub, and distributing logs, furnished with perforations; means being adopted, by the employment of valves and floats, to regulate the supply.

The claims are to the application of an inclined plane, as described; to the regulating tub, valves, and floats; to the equal distribution of the water by means of gravel; and to "the successful application of a cemented water-tight surface upon a natural soil, by means of coating the same with hydraulic cement, as hereinbefore described."

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27. For a *Reaction Water Wheel;* John B. M'Cord, Galena, Daviess county, Illinois, May 16.

The description of this wheel is given in very general terms, and we cannot find any thing in it by which to characterize it. No part or portion of it is claimed.

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28. For an improvement in *Carriages, and other machinery with Wheels;* John Williams, and John Wing, Hartford, Hartford county, Connecticut, May 16.

The so-called improvements are very obscurely described in the specification, and very imperfectly represented in the drawings, the whole being the very reverse of "full, clear, and exact." It seems, however, that the main novelty is one of great antiquity, namely, the application of friction wheels above the axles of the main wheels. The patentees say, "We claim as our invention, only, wheels framed into the side of carriages to tread on the axles of carriages, or revolving between standards for the gudgeons, or drums, and wheels, to roll in; and the extra neap and shaft, to be applied as specified; and also a case for the forward axle to roll in."

It is a little strange that men living in the centre of machinery and manufactures should suppose themselves to be the inventors of friction wheels, which have been frequently applied in the way proposed, and as frequently abandoned.

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29. For a *Capstan;* Calvin Oaks, Rochester, Monroe county, New York, May 16.

This is a very ingeniously contrived and well arranged capstan, and so far as we can recollect, it possesses a sufficient portion of novelty. The drum head of the capstan is separate from the barrel, and fits on to the square end of a stout shaft which is round below this part, and passes through the barrel and deck, into a step on the lower deck. The drum head may be secured to the barrel by bolts, or pins, and when this is done the levers inserted into the holes in the drum head, turn it as a common capstan; at about the middle of this shaft, and just above the level of the deck there is a pinion fixed

which may be seven inches in diameter. The stool of the capstan, which is furnished with palls, as usual, contains a hollow wheel of two feet nine inches diameter, having teeth on its inner edge, on a level with those on the pinion. A spur wheel of about a foot in diameter, may be made to fall into gear with the two former, or may be depressed so as to fall into a hollow in the deck, a lever adapted to that purpose being attached to the deck.

When the capstan has been used in the ordinary way, and more power is required, the pins connecting the drum head and barrel are removed, the intermediate wheel below is thrown into gear, and upon turning the drum head, the barrel will be moved in a reverse direction, with a power greatly increased, as may be readily calculated. The claims made are,

"1st. The separate drum head with the square hole through it, fitted to a square portion of the main shaft, and the screw and nut to keep it down, as described.

"2nd. The connection pins, or bolts, for the use described.

"3rd. The journal and small spur wheel on the shaft, with the manner in which the second spur wheel is arranged with it, to play into, or out of, gear, and continue the motion to the next.

"4th. The manner and application of the large rim wheel, and for the intent described.

"5th. The arrangement of the lever, and connection with the axle of the second spur wheel, for the end described."

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30. For improvements in the *Making of Rovings, spinning and doubling of cotton, silk, flax, and other fibrous substances;* granted by special Act of Congress, to James Jones, of Salford, near Manchester, England, May 16.

These improvements were made the subject of a patent in England, which was sealed on the 25th of May, 1833, and a description of them, with a plate, may be found in the "London Journal of Arts and Sciences," (Newton's) vol. 5, conjoined series, p. 113. As the English and American specifications appear to be identical, we shall quote a few lines from that journal relating to it.

"These improvements consist in certain arrangements of machinery, by which the bobbins and flyers are driven, or made to revolve, at speeds differing from each other, in order to cause the yarns, after being spun, to be taken up upon the bobbins with a certain tension."

"The first feature of the improvement is a contrivance designed to drive the flyer with a speed very considerably greater than that of the bobbin; the second is a mode of driving the bobbin faster than the flyer; and the other improvements are modifications of the same principles."

After describing the various modifications of the apparatus, by reference to the drawings, it is stated that "The patentee claims, first, the adaptation of the rotary wheels, or pulleys, for giving the increased speed to the disks which carry round the flyer, or the bobbin independently of the spindle; secondly, the tension band passed

round a pulley, for regulating, or tempering, the drag of the bobbin; and thirdly, the two flyers acting conjointly, as described."

The causing the flyer and spindle to revolve independently with different and regulated velocities has been the subject of more than one patent. It makes a part of that noticed in the last number, as granted to Jackson, Potter & Miller, p. 310; and the same thing had been previously effected, by machinery differently arranged. Whether that under consideration, presents any advantages over those methods to which we allude, is a question which practice must decide, we, however, are of opinion that it does not possess any superiority.

We do not perceive any thing in the present invention which gives to it any claim to that special legislation by which it has been distinguished above the general class of foreign inventions; although we see no valid objection to the giving to foreigners, under proper restrictions, the right to obtain patents in the United States, inasmuch as Americans have this privilege extended to them in other countries.

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31. For a *Thrashing Machine;* Washington F. Pagett, White Post, Frederick county, Virginia, May 24.

A long description is given of this thrashing machine, which we shall cut down by inserting the claim only, which is to "the arrangement of the spring and friction roller to allow of the receding motion of the concave; and also the construction for obtaining the same end by means of the long arms, to apply a weight for the purpose. The manner of constructing the cap for the purpose of adjusting the main, or any other shaft."

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32. For a *Lath Machine;* David M. Cradit, Ithaca, Tompkins county, New York, May 24.

A circular saw is made to revolve on one part of a bench to cut off the boards, from which the laths are to be made, into proper lengths, and a knife, four feet six inches long, is employed to cut the laths at a single stroke. The description of the machine, and the drawing by which it is intended to be represented, do not, together, afford a clear idea of the manner in which it is to made to operate. We are informed that "the object of the machine is to manufacture laths of an equal, uniform and proper width, for the lathing of buildings," but there is not any thing claimed as new. A patent was obtained three or four years ago, for a lath machine in which a long knife, similar to the foregoing, was made to cut laths from plank, in a similar way.

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33. For a *Pump;* Philo C. Curtis, Utica, Oneida county, New York, May 24.

The liquid to be raised is to be forced up by pumping air into the vessel containing it, which may be a barrel in a cellar, or a closed vessel contained in a well or other reservoir. The pump barrel is placed upon a suitable stand, and has two valves at its lower end, one

opening inwards to admit air, and the other opening outwards to allow the air to be forced through a tube into the upper part of the vessel containing the liquid. From the lower part of this vessel there is an ascending tube, to carry the liquid to the point of delivery. There is a cork in the first tube, near the pump barrel, to allow the air to escape from the vessel in a well, &c., that it may receive a new supply of water through a valve on its lower side, opening inwards.

"What I claim as my improvement, consists principally in arranging the parts in a form that water or other liquid can be raised advantageously without entering the body of the pump, by means of a vessel as above described, and a tube leading to the same, from the pump, provided with a cork to enable the person working the pump to fill and discharge the vessel with air and water alternately. I also claim as my improvement the solid metal piston."

There is but little novelty in the arrangement referred to, and there is none in the solid metal piston; air pumps having been repeatedly made with such pistons; and we will venture to assert that the patentee will not manufacture many such, in which case he might have omitted this part of the claim without a risk of loss.

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34. For *Increasing the adhesion of the hind wheels of Locomotive Engines;* Charles and Geo. Escal Sellers, city of Philadelphia, May 22.

A patent was obtained by Mr. E. L. Miller, on the 19th June, 1834, (see p. 48, vol. 15) for a method of obtaining a similar end, by throwing the weight of a car, or tender, on to the hind part of a locomotive engine. The present patentees effect the object by "so coupling, or connecting the cars containing the load to be drawn, to the body of the locomotive engine, as that the load by its action upon a lever, or standard, shall tend to raise the fore end of the locomotive, in any desired degree, and thus to lessen the pressure upon the fore, and transfer the same to the hind wheels."

The patentees say that they "do not mean to limit themselves to any particular form or manner of constructing the parts concerned in producing the intended effect, but claim as their invention the connecting to a Locomotive Engine, the load which is to be drawn by it, in such a manner as to throw a larger portion of the weight of the locomotive upon its hind wheels than they are ordinarily intended to sustain, in the manner, or upon the principle hereinbefore set forth."

It will be readily seen that the coupling bar, or jointed rod, by which the car is attached to a locomotive, if attached to it at a point considerably above that by which it is attached to the car, will tend to lift the latter, and to draw down the former, and thus to increase the adhesion of its hind wheels.

35. For an improvement in *Mills for Sawing Stone;* Joseph L. Dutton, city of Philadelphia, May 22.

This patent is taken for the particular construction of the building in which the sawing is to be effected. In the first place, the floor of the mill is to be raised to such a height from the ground "as to be on a line with the bed of the log or marble teams, by which means most of the expense incurred by unloading, and reloading, is saved." On this elevated floor are placed several short transverse railways, upon which run cars to which the blocks of stone are transferred, immediately from the common teams, and by which they are supported during the operation of sawing.

Above the before mentioned railways, the frame work of the building supports other railways upon which also there is a car furnished with a screw, by means of a chain dependent from which, a block of marble may be suspended and transferred to any part of the mill where it may be wanted. A crane is likewise constructed, which sustains a car similar to that last described, for aiding in the transfer of the stone from one part of the building to another. The arm of this crane is supported upon friction wheels, running upon a suitable curved way, erected for that purpose.

"I claim an exclusive right to the raising of the mill floor, as above described. The traversing car. The application of the upper car to saw mills. The crane whether applied to saw mills, or for any other purpose; and the regulating spring of the saw slides."

We think that the foregoing claim is very susceptible of improvement. The mere raising of the floor, for the purpose pointed out, we do not think new in saw mills, for we err greatly if we have not seen, in Philadelphia itself, a mill, for sawing mahogany, with the floor so raised "as to be on a line with the bed of the log" carriage. Nothing is said about any novelty in the traversing car which is to receive the stone, nor do the upper cars differ from such as have been used for raising and transferring loads, for other purposes. The crane is claimed, "whether applied to saw mills, or for other purposes," now this assuredly does not mean a crane generally, yet we are not told in what particular this crane differs from others; a thing that should not be left to be inferred, but which ought to have been particularly specified. The fact is that the novelty and utility of the structure consist not so much in the formation of its individual parts, as in the general arrangement and combination of the whole, by which it is adapted to the attainment of the object proposed, and upon this the claim to invention must mainly rest.

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36. For a *Kitchen Boiler;* John and William C. Bailey, Farmington, Kennebec county, Maine, May 22.

A cylindrical metal boiler five or six inches in diameter and twelve inches long, is to be let into the back of the chimney, just above the fire, so that one side of it will be exposed to its action. This boiler is to be entirely closed, excepting where a tube enters it, by which it is to be filled with water, and is to supply heat to

that contained in a wooden cistern. This tube is to pass through the jamb, or in some other way to be conducted into the aforenamed cistern, which, being filled with water, will supply the boiler after the heat has expanded, and driven off the air from the latter. The water from the boiler is then to heat that in the cistern, which is to be employed for washing, steaming, or other domestic purposes. The cistern is to have a close fitting lid, to confine the steam, when necessary, and the specification contains directions for its use in various ways; the whole scheme appears to be considered as new, as there is no claim made; similar, but much better, contrivances, however, are well known; the present would be condemned, were there no other defect in it than the impossibility of cleaning out the boiler, but it is, in other respects, essentially imperfect in its arrangement.

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37. For an improvement in *Paddle Wheels, and in the Propelling of Canal Boats;* Benjamin M. Smith, Rochester, Monroe county, New York, May 22.

The floats of the paddle wheels, instead of being of one continuous surface in width, are to be divided into three or more parts, which are to be placed one behind the other, like the treads of steps, a sufficient width being given to each arm for that purpose. The direction of the wheel, when in motion, is such that the inner width of the paddle is in advance of the others. The patentee thinks that "the advantages of this arrangement are, that when the wheels are put in forward motion, the lateral pressure, or force, is much diminished, and the useful effect is very materially increased over wheels of the ordinary construction, chiefly owing to the floats lifting less water as they approach, or rather leave, the surface."

One main difficulty in propelling boats upon canals, it is observed, results from the want of sufficient power in the floats, from the circumstances which necessarily restrict their size. This it is proposed to obviate by increasing the number of paddle wheels, either upon the ordinary construction, or upon the plan of the patentee, using four, or such other number of, wheels as may be found necessary.

"Now, what I claim in the above described wheel, and its application, is the mode of dividing the floats into sections, and giving them the relative positions herein set forth. I furthermore claim the principle herein described and illustrated, of diminishing the dimensions of the paddle wheels, and increasing their number in a like ratio, for the purpose of attaining a maximum speed with the least lateral pressure on the banks."

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38. For a *Cooler for Flour;* Joseph Hebard, John B. Catlin, and Thomas G. Abell, Pomfret, Chautauque county, New York, May 22.

"The improved cooler consists of a rolling screen, or shaking sieve, which receives the ground grain, or meal, from the elevators. by means of a common conveyer, instead of having it conveyed to hopper boys, as is usually the case. The conveyer which receives the

meal from the elevator, and conveys it into the screen. The spout which conducts the coarse bran from the screen. Conveyers which are placed under the screen, and receive the meal after it is separated from the coarse bran, and conduct it back and forth through the machine a sufficient number of times to cool it. A spout which receives the meal from the last conveyer, and through which it falls into the bolter; and a case which covers the whole, excepting the first conveyer, with slanting sides, to direct the meal which falls, or is sifted through the screen, into the last conveyer."

The drawing represents three conveyers below the rolling screen, which successively receive the meal, and convey it back and forth, and the specification enlarges upon the advantages derived from the use of this apparatus, which is simple in its principle, compact, and, we have no doubt, efficient. There is no claim made, but it is obvious that the general arrangement is the subject of the patent, the individual parts being spoken of as familiarly known.

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39. For a *Composition to Prevent the Absorption of Oils by Wood;* Nathaniel Hathaway, Fairhaven, Bristol county, Massachusetts, May 22.

The patentee claims "the application of glue to prevent the absorption of animal and fish oil by wood, whether used alone, or combined with the other ingredients aforenamed, and whether those ingredients are used in the proportions set forth, or in other and different proportions."

Glue has been used between the staves of oil casks, to prevent the leakage which otherwise takes place, and a few years ago this application was made the subject of a patent. The effect of glue in this particular is so familiarly known, that, had any one inquired of us how to prevent the absorption of oil by wood, we should have said, "saturate it with glue," and that without supposing that we were telling a secret.

The composition referred to by the patentee is two pounds of glue, dissolved; one quarter of a pound of *whale foots;* one quarter of a pound of bright varnish; and one quarter of a pound of rosin, melted together, and combined by stirring, adding thereto a sufficient quantity of water to give it a proper consistence. This composition, it is said, is more easily used than the glue alone, as it will longer continue limpid.

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40. For a *Lamp for Burning Volatile Materials;* George Eyles, Boston, Massachusetts; an alien, who has resided two years in the United States; May 22.

The construction of this lamp is very much like that of the blow pipe by alcohol; but it is not, like it, furnished with a reservoir and wick below the recipient of the spirit; but the jet through which the vapour is to issue is carried down below the body of the recipient, and thus supplies the requisite heat.

41. For a *Washing Machine;* John T. Denniston, Alexander, Genesee county, New York, May 22.

A cylinder, like a barrel churn, is to revolve on gudgeons; on the inside of this there are to be strips of wood, running from head to head, forming flutes like the teeth of a wheel, projecting inwards. Within this barrel there is to be a loose cylinder, extending nearly from end to end, having flutes upon it which mash between the strips on the barrel. This is to be of metal, or of wood loaded, and the washing is to be effected by the rolling of this upon the clothes.

The claim is to "the peculiar construction of the inside of the outer cylinder; and to the detached cylinder, and their application to the purpose of washing."

Most of the washing machines which have been introduced, have proved to be more troublesome than beneficial, and to this class the present will undoubtedly belong; the clothes will become lapped round the detached cylinder, and will make sad inroads upon the pacific disposition of the washerwoman.

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42. For improvements in the construction of *Time-pieces;* William Pardee, Albany, New York, May 22.

The improvements claimed in this time-piece, refer both to the case and the movement. The object in view is to construct an instrument, which, whilst it possesses the requisite accuracy, may also, from the simplicity of its construction, be afforded at a price far below that of those now in use.

The whole case for a mantel time-piece, including the dial-plate, is to be cast in one entire piece, of iron, zinc, or other metal. In the movement there is to be three wheels, and two pinions only, arranged in a manner very similar to those in Ferguson's clock. The following is the claim.

"I do not claim to be the inventor of a time-piece, with three wheels and two pinions, such having been before constructed; but what I do claim as my invention, is the general arrangement and combination of the respective parts, made and operating in the manner described; not intending, however, by this claim, to confine myself to the precise form and manner of construction designated; but to vary the same in any way which I may think proper, whilst I proceed substantially upon the principle by me laid down. I also claim the casting, in metal or in sand, in one entire piece, the cases, or stands, of mantel, or bracket, time-pieces, as hereinbefore shown. I also claim the casting, in *metal* moulds, the straps and pillars, the pulleys, the pallets, and other parts, so as to come therefrom in nearly a finished state."

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43. For a *Double Lever Scale;* Elias A. and Asa Hibberd, Lunenberg, Essex county, Vermont, May 29.

This is a platform balance, in which the arrangement of the levers differs in some points from any which has preceded it, but not in a way which appears likely to give greater accuracy to the instru-

ment; a thing, indeed, hardly to be desired. A scale is hung upon the steelyard, in such a situation as to weigh a hundred fold, and a movable poise gives the intermediate weights. The claim would occupy more than a page, and we cannot, therefore, find room for it; it includes the whole description of the machine, and extends to many things which have been before used.

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44. For an improvement on the *Roller Gin*, patented March 7th, 1834; William Whittemore, Jr., West Cambridge, Middlesex county, Massachusetts, May 29.

This machine is well described, and distinctly represented in the drawing; without the latter, its description could not be made clear, nor would the claim be intelligible. As it is an instrument in which but few of our readers are interested, the necessity of passing it over with this slight notice is the less to be regretted.

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45. For improvements in the *Boilers, Valves, and Cam, of the Steam Engine;* John Kirkpatrick, city of Baltimore, May 29.

The specification of this patent will hereafter be published, together with that of some further improvements, which are now nearly completed.

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46. For a *Cast-iron Cider Mill;* Philip Pryer, Alexander, Genesee county, New York, May 29.

This mill is formed much like the common bark mill, with a nut on a vertical shaft, revolving in a cast-iron box. The grooves, or flutes, in the nut and box, are sufficiently deep at top to receive the apples, and diminish as they run spirally down to the lower side, where the grinding is finished. The exact dimensions of the respective parts constitute nearly the whole of the description, and the claim is to "the cast-iron cylinders, with all their above described particulars in form and use."

We should have been at a loss, had the task of making a claim devolved upon us, as there is an equal want of originality in the particular parts, and in their mode of combination.

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47. For a *Churn;* Philip S. Lowell, Farmington, Kennebec county, Maine, May 29.

This churn is much like that noticed at No. 11. The body of it is an oblong box, in which there are two dashers, worked by two cranks upon a shaft above it. The patentee has found the means to occupy several pages with the description, and has thus made up in length what the affair wants in originality; whether the entire omission of a claim results from the difficulty of making one, in the present instance, we have not the means of knowing.

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48. For a *Thrashing Machine;* Edmund Warren, city of New York, May 29.

This is a cylinder and concave machine, combining about as much

of novelty as we usually meet with. "The claims in this case are, the form of the frame, made of two pieces of timber, or plates, for the sides, and two for the cross work, which are so arranged as to permit the grain to pass in or out at either side, which will self-sharpen the beaters, and make a strong and cheap frame; also, the principle of reversing the beaters; also, the concave of equal height on both sides, which carries the straw, or throws it, fifteen feet from the machine, and saves the work of a man to clear it away from the machine."

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49. For a *Machine to Excavate and Remove Earth;* Nathan Currier, Methuen, Essex county, Massachusetts, May 29.

One, two, or three spades, made in the form of the common scraper used for excavating, are to be hung upon a carriage running upon wheels. There are windlasses and chains for raising or lowering the cutting edges of the spades, and for turning them over when the load is to be discharged.

All that is claimed, is, "the form of hanging and arranging the spades, together with the manner of turning them over to unload."

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50. For *Furnaces for Burning Lime, and Smelting Ores;* John Owings, Adams county, Pennsylvania, May 29.

Much more is proposed in the specification of this patent than will ever be accomplished by the patentee, but this is a case so frequent, that it ought to produce but little disappointment. By means of the kiln, or furnace, described, wood is to be converted into charcoal, and by means of the heat evolved in this process, lime is to be burnt, and iron, and other, ores reduced. A furnace is to be built, the side walls of which may be forty-five feet in length, and ten feet in height, leaving ten feet in the clear between them; this furnace is to be arched over from end to end, and at its bottom there are to be grate bars, at the height of two feet from the ground, a number of pillars being built to support them. Several air holes are to open into the space under the bars, all of them furnished with air-tight shutters; there are also several flues on each side, and a main flue at one end, all capable of being closed when necessary. The wood to be converted into charcoal, is to be first placed upon the bars, to the height of a foot, and upon this six inches of limestone, which is to be succeeded by alternate layers of each, until the furnace is filled to the top of the arch.

When ores are to be reduced, they are to take the place of the limestone, and the bottom of the furnace is to be so constructed as to receive and conduct the reduced metal to the front, whence it is to be drawn off. When the reduction has not been completed by the charring process, air is to be admitted, so as to allow the charcoal to burn partially, until the heat is sufficient; after which the residue is to be collected. If pit coal is used, it is to produce coke in the same way, which also is to be saved.

What is claimed as new, "is the use of a raised floor, or grating,

whereon to rest the stone, or ore, and fuel, in combination with the vents, as herein set forth, by which the heat of the furnace is rendered perfectly manageable, and the balance of the fuel, after the operation of burning, or smelting, is converted into charcoal, or coke, when wood, or bituminous coal, is used."

The patentee has set forth numerous advantages which are to result from his invention, "the principal of which are the saving of fuel in the burning of brick, tiles, delft, &c., &c.; to iron and brass founders, manufacturers, and builders, all of which would be interested by the low rate at which the valuable articles of lime and charcoal could be procured," &c.; from the whole affair, however, it is plain that he is neither an experienced lime burner, an iron founder, or a smelter of other metals; if the former, it would not have been necessary for him to have discovered, by the aid of a smiths' forge, that lime acquires about a welding heat for calcination; and if a founder, he would never talk of reducing iron ore by means of wood, or coal, alone, and saving the charcoal, or coke.

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51. For a *Machine for Making Brick;* William Tucker, Luray, Page county, Virginia, May 29.

To describe this machine, would be merely to exhibit the particular arrangement adopted by the patentee in placing his hopper, which is to receive the prepared clay, the brick mould, presser, striker, &c., which have frequently been combined together in a very similar manner. His claim is, to "the manner in which he combines and puts together the several parts, as set forth."

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52. For a *Mortising Machine;* Ira Gay, Dunstable, Hillsborough county, New Hampshire, May 29.

After describing his machine, the patentee says, "I do not claim any part of said machine as new in itself, but claim the combination of the known mechanical contrivances in such a manner as have not heretofore been used for the purpose herein described." This indefinite mode of making a claim has become very common, of late, but it certainly does not fulfil that requirement of the law which makes it the duty of the patentee to distinguish his machine "from all other things before known or used." Two machines for the same purpose may be very differently arranged, and yet be substantially the same, in which case the difference of combination would be but colourable on the part of the last claimant, and his patent could not be sustained. We cannot, indeed, perceive any difference between the foregoing claim, and the not making any, as we should esteem it as claiming the whole machine.

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53. For a *Hat Block;* Aaron and Samuel Chichester, Wilton, Fairfield county, Connecticut, May 29.

This hat block is intended to be used in the colouring of hats, and is of the open kind which allows the colouring liquid to come freely into contact with the interior of the article, in the process of dying.

It differs from those open blocks which have preceded it, by being so made as to dilate after being inserted into the crown of the hat, so as to cause it to set close, or tight, thereto.

A piece of metal, of suitable size, is to be made circular, and is to be perforated, near its edge, by eight, or any other convenient number of mortises, which are to receive the ends of eight slats, or pieces, of wood, which are to form the sides of the open block. This round piece of metal may be called the fixed head. A smaller disk of metal fits within the slats, passing in at the lower end, and having its edge notched to receive the inner edges of the slats, the latter being made sloping, so that this movable head, as it is forced in, will cause them to recede from each other. A screw passes from the centre of the fixed to the centre of the movable head, by which the latter is forced in, and the effect intended produced. The contrivance being deemed essentially new, no particular claim is made.

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54. For a *Machine for Planing Sash Stuff;* Ira Gay, Dunstable, Hillsborough county, New Hampshire, May 29.

The claim to this machine is in the same terms as that made to No. 52, for mortising. The planes are to be made to travel back and forth, as in other machines for planing sash stuff; the method of effecting this differs from, but is not better than, the plans previously adopted.

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55. For an *Odometer;* Joseph Fuller, and Aaron A. Richardson, Brunswick, Cumberland county, Maine, May 29.

The patentees denominate this "an improvement in the art of measuring and indicating distances traveled by wheeled carriages." Such machines have been constructed in numerous ways, and have been made to operate so well as to leave but little to desire in this particular. The patentees say, "we do not claim an exclusive right to odometers, or machines for measuring and indicating distances traveled by wheeled carriages; but we do claim the lever and the cams, their form and connexion with each other, and the general arrangement above specified, as our improvements, and we further claim whatever is new in the above described machine."

We gave the specification of Mr. Turner's odometer, with a plate, at p. 336, vol. xiii. The operation of this machine was perfect, but we presume that the demand for it has not amounted to half a dozen; it, therefore, is to be considered more as a thing of curiosity than of utility, and any man of ingenuity may contrive twenty different modes of arranging the parts, and call them improvements, but the public will not buy them.

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56. For a *Thrashing Machine;* Henry Johnson, Washington county, Tennessee, May 29.

A claim is made to "the making, putting on, and operating, of the cogs, or thrashers, on the cylinder, and the elastic apron underneath

the said wheel, or cylinder." What is called the "cogs, or thrashers," consists of teeth placed obliquely upon cast-iron beaters, in which there is about as much novelty as there is in "the elastic apron underneath."

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57. For an improvement on the *Straw Cutter;* Stephen Ustick, city of Philadelphia, May 29.

This is intended as an improvement of the machine previously patented by Mr. Ustick, and which we noticed in due course; the description of this improvement could not be understood without the drawing, nor would the claim alone give any adequate idea of it.

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58. For an improvement in the *Cooking and Baking Stove;* Hiram G. Phelps, Pleasant Square, Johnstown, Montgomery county, New York, May 29.

The omission of a claim in a cooking stove, must necessarily leave us at a loss to discover what is intended to be patented, and such is our situation in the present instance. The stove is to be made principally of sheet tin, or other polished metal, capable of reflecting heat, and the cooking is generally to be performed by means of charcoal, though other fuel may be employed. It is proposed, usually, to have two ovens, one above the other, with a flue, or reservoir of heat, between them; various modifications of the construction, however, are mentioned, but as they certainly are not all new, and are indiscriminately presented, our only clear course seems to be to pass them by, until the patent is reissued under an amended specification, should this ever be done.

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59. For a *Cooking Stove;* John C. Kolbe, city of Philadelphia, May 29.

This stove is the same in form and substance with the cooking stove patented by A. D. Spoor, and described at p. 103. The only difference consists in making the holes in the top plate, to receive kettles, &c., nearer to the edge, and placing a dividing, or intermediate, plate in the drum, with openings in it to direct the heated air under the cooking utensils. The claim made is to the "placing said plate in the cylinder, or drum, as above described, dividing it into two parts, and collecting the heat above such plate, and directing it into a flue opening near the centre."

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60. For a *Power Gaining Machine;* Philo C. Curtis, Utica, Oneida county, New York, May 29.

This the patentee calls "A method of applying power to produce an increased velocity by means of cams, or inclined planes, arranged circularly around the shaft, or wheel, to be driven."

Were we inclined to waste money and time, we might do so by giving a copy of the drawing and description of the apparatus here patented, which is a kind of horse power, in which the animal, at-

tached to a lever, is to turn a wheel, so connected to a shaft by means of movable levers, inclined planes, and friction wheels, as to increase the power without diminishing the velocity.

SPECIFICATIONS OF AMERICAN PATENTS.

Specification of a Patent for an improvement in the Mode of Heating and Applying Heated Air to Blast Furnaces. Granted to ISAAC TYSON, Jr., *city of Baltimore, April* 18, 1834.

To all whom it may concern, be it known, that I, Isaac Tyson, Jr., of the city of Baltimore, have invented an improvement in the mode of heating and applying heated air to blast furnaces in metalurgical operations, and I do hereby declare that the following is a full and exact description thereof.

It is a well established fact that great advantage is derived from heating the air which is to be applied to furnaces for smelting, and other operations of metalurgy requiring high degrees of heat; and my invention or discovery consists in a mode of taking advantage of this principle in a new way, which will admit of the employment of anthracite coal so as to supply a large portion of the heat required, and a consequent and great diminution of the proportionate quantity of the charcoal or coke usually employed.

The form of the apparatus which I employ will admit of considerable variety; I do not therefore confine myself to that particular modification which I am about to describe, as I have chosen this on account of its simplicity, to exemplify the principle upon which my invention is dependent.

I construct a cylinder of cast, or wrought, iron, of such dimensions as must be determined by the size of the furnace to be supplied, and the degree of temperature to which it is determined to heat the air. This cylinder I place vertically, and make one opening in the side thereof for the admission of air from the blowing apparatus, and another for the conveyance of the heated air into the furnace; placing them in such positions as shall cause the heated air, in its passage from one to the other, to be subjected to the heating influence of the ignited fuel which is contained within the cylinder.

The cylinder I line with fire brick or other non-conductor of heat, suitable for the purpose, and within it I place a grate to contain the ignited fuel which is to heat the air. This grate may extend across the entire cylinder, so as to support the fuel; it may be situated at any convenient part of it between the pipes for the ingress and egress of the air. Proper openings must, of course, be made in the cylinder for the supply of fuel, which may be contained in a reservoir, so as to be heated before it is introduced; the modes of effecting this are known to those conversant with furnaces.

Sometimes I intend to enclose a second cylinder within the former, which second cylinder is to contain the fuel, leaving a space between the two for the circulation of air. This second cylinder is to be open at top for the introduction of the fuel, the space between it and the

outer one being permanently closed; it may reach down to the bottom of the entire cylinder, or nearly so. The upper part of it, say for half its length, more or less, may be made without openings, whilst the lower part is to be formed into bars, or otherwise perforated in the manner of a grate. When filled with fuel, an air tight cover is placed upon it, being made close by luting or otherwise. The upper part of this cylinder serves as a reservoir for fuel, and to adapt it to this purpose more fully, it may be extended to any convenient height above the outer cylinder.

Instead of allowing the pipe through which the blast is introduced to terminate at the inner surface of the outer cylinder, I intend sometimes to conduct it across the space between the two, and into the inner cylinder within which the fuel is contained; governing myself in this and other points by the degree to which I may find it desirable to heat the air.

Although I do not intend to confine myself to the employment of anthracite coal in my heater, yet it is my design in most cases to use it exclusively, believing that one of the great advantages of my invention will consist in so doing, and that by heating the air therewith, I may diminish the quantity of charcoal or coke to such an extent as only to require such a portion to be mixed with the ores, or other metallic matter, as will be necessary to keep up the ignition, and to produce the requisite chemical action.

What I claim as my invention, and for which I ask a patent, is the heating of the air, which is to be supplied to blast or other furnaces, in a separate vessel, in which it is to be brought wholly or partially into contact with ignited fuel, upon the principle, or in the manner, hereinbefore set forth, whether the same be done precisely in the way described, or in any other in which the same effects are produced by analogous means.

ISAAC TYSON, JR.

Specification of a Patent for an improvement in Machinery for the Throwing, or Twisting, of Silk. Granted to LUCILIUS H. MOSELY, *Poughkeepsie, Dutchess county, New York, May* 9, 1835.

The ordinary method and machinery in use, (for which the one invented by me is intended to be a substitute,) consists of two rollers, one resting upon the other, and weighted down by means of a spring, or dead weight, in order to prevent the thread from passing through faster than the natural delivery of the rollers; the threads being governed through the rollers, and down to the spindle, by means of guide wires on each side of the rollers. My improvement, or invention, is this,—that in lieu of the two rollers and guide wires, a single grooved roller is used for each thread, with a band of leather around and affixed to its larger surface, its smaller surface being a polished groove, on which to secure the thread, and pass it to the spindle, the thread being passed over and around the groove. This grooved roller is turned (thereby delivering the thread to the spindle,

or spool,) by a second roller, on which it rests, the leather surface touching and resting upon this second roller, and is carried round by it, by reason of the mere weight of the grooved roller. This grooved roller revolves around a screw-pin, or pivot, passing through its centre, and affixed to an arm, the other end of which arm is attached by a like pin, or pivot, to a part of the twisting frame, (or to a stand which is attached to the twisting frame,) in such a manner that the end upon which the grooved roller is placed, may (together with the roller) be raised from the second roller, when necessary, either for attaching or detaching the thread. This grooved roller may be made of different metals, or of other materials.

The benefit of this improvement and invention, is, that it dispenses with the guide wires, is more simple, easier to tend, does not mangle, cut, or waste the thread, and is more rapid in its operation than the method now in use.

LUCILIUS H. MOSELY.

Report to the Directors of the Grand Junction Railway, between Birmingham and Liverpool, England. By JOSEPH LOCKE, Chief Engineer.

GENTLEMEN:

In submitting for your consideration, the following remarks on the subject of rails and chairs, I wish briefly to state the reasons that have induced me, (after you have already decided on the form of rail,) to investigate the question. Under ordinary circumstances, I might have been justified in simply giving a preference to a particular form of rail, without stating the grounds on which that preference was founded; but considering the present conflicting opinions on this very important subject, and the scarcity of data upon which to form a correct judgment, I have thought that, by contributing the few observations I have made to the general stock, the cause in which you, as well as the public, are interested, might be advanced.

The longitudinal and transverse forms of rail, the form of chair and fastening, and the propriety of placing the blocks further apart, are the subjects to which I have more particularly directed my attention.

The fish-bellied, or elliptical, form of rail is already well known. It is deepest in the middle, between the supports, and the material is so disposed, that, when uniformly loaded, it is equally strong at all points.

The parallel rail, on the contrary, is weakest in the middle, and, if loaded excessively, would break midway between the supports; and as it is absolutely necessary to give the requisite strength in the middle, it follows that at every other part, the parallel rail is unnecessarily strong.

The strength of a uniform bar of iron is as the breadth and square of the depth directly, and as the length inversely. In other terms, if the breadth be doubled, its strength is doubled; if the depth be dou-

bled, the strength is quadrupled; and if the length, or distance, between the supports be doubled, then the strength is impaired one-half.

If an elliptical bar be $3\frac{1}{2}$ inches at the least, and 5 inches at the greatest, depth, a parallel bar of equal weight will be about $4\frac{1}{4}$ inches, and the relative strength in the middle, (supposing the breadth and distance between the supports to be constant,) being as the square of the depth, will be as 25 is to 18.

This advantage, however, is only gained at one point, viz: midway between the supports; and it gradually diminishes, until it corresponds in depth with the parallel bar, which, when the supports are three feet apart, is at nine inches from the end, and at this point the two rails are equally strong; but for the remaining distance to the support, the parallel bar is the strongest.

I am aware that, theoretically speaking, the extra strength of the parallel rail near the ends is of no advantage, because, as has been well observed, the efficiency of a structure can only be estimated at the weakest point; but I wish that circumstance to be noticed, as I shall have occasion hereafter to direct your attention to it.

The formulæ for ascertaining the strength of iron beams are derived from experiments made upon peculiar sections, and with various kinds of iron. Some experiments have recently been made at Newcastle, on the strength of railway bars, and these, therefore, are more applicable to our purpose than any others, although they are not altogether free from objection. The deductions, which I think are very fairly drawn from these experiments, are,

That an elliptical rail weighing 45 lbs. per yard, is equal in strength to a parallel rail, weighing 50 lbs. per yard.

That when a weight of 96 cwt. was applied in the middle, with 3 feet bearings, the deflection in the former was $\frac{1}{20}$th of an inch, and in the latter $\frac{1}{14}$th part of an inch.

The depth of the fish-bellied rail in the middle was 5 inches, and at the end $3\frac{1}{2}$ inches. The depth of the parallel bar was 4 inches.

Now, if the two rails had had similar sections, the parallel bar ought to have been $4\frac{1}{4}$ inches deep, instead of 4 inches, and would have been $\frac{1}{5}$th stronger.

However, I think there can be no doubt that, both theoretically and experimentally, of the two rails with similar sections, the elliptical, with the same quantity of material, is the strongest form.

But the question for consideration is, whether, from the construction of railways, and the effect of heavy bodies rolling along them at high velocities, we can safely apply theoretical or even experimental deduction? For my own part, I think that the experience obtained from the working of the Liverpool and Manchester, and other railways, affords much safer data upon which to proceed; and although I would not reject experimental data, I would only apply it in connection with the more generally practical results obtained from these lines.

It is well known that a very considerable number of the elliptical rails on the Liverpool and Manchester line has been broken, whilst

on those lines where the parallel rails have been used, there are few instances of a broken rail. The causes that have led to this unexpected result will hereafter be considered.

By far the greater number of rails have broken at about 7 or 8 inches from the block, and, in nine cases out of ten, at 7 or 8 inches from the joint block, or end of the rail. This circumstance has induced a belief that the rail is not of the true eliptical form, but that it is weakest at this point; it will, however, be found that the point where the greatest deviation from the elliptical form occurs, is not that at which the fractures have generally taken place.

The rails used on the Liverpool and Manchester railway weigh 35 lbs. per yard—the greatest depth is $3\frac{1}{2}$, least depth $2\frac{1}{2}$; now, the effect of any weight at different parts of the rail is as the rectangle of segments into which it is divided. If therefore it be necessary to have a 3 feet rail, $3\frac{1}{2}$ inches deep in the middle, the depth at nine inches from the end will be as $18^2 : 8 \times 28 : : 3\frac{1}{2}^2 : 2.91^2$ inches; but the actual depth is 2.94 inches, therefore it is at this point about 1-30 of an inch too deep. The calculated and ascertained depths at other parts of the rail are:

	Calculated depths.	Actual depths.
At 6 inches from the end,	2.60	2.76
7	2.77	2.85
8	2.91	2.94
9	3.03	3.02
10	3.13	3.10
11	3.22	3.20
12	3.29	3.30
13	3.36	3.36
14	3.41	3.40
15	3.45	3.44
16	3.47	3.45
17	3.49	3.49
18	3.50	3.50

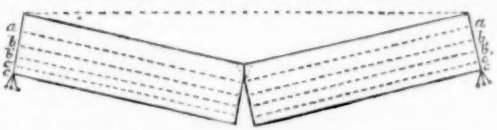
Thus we find, that up to 9 inches from the end of the rail is stronger than theory assigns, whilst from 9 inches to 12 it is a little weaker, but in so small a degree as not to be worth considering. The depth of the rail, at 9 inches from the end, is equal to the depth due to a parallel rail of the same weight per yard. And if the Liverpool rails had been parallel instead of elliptical, and of the same weight, the fracture, instead of being near the end, would, according to theory, have been in the middle, and the number of broken rails increased in the proportion of nearly 2 to 3. There have been no parallel rails exactly of this weight made; therefore, whether this proportion would hold true in practice remains undetermined. If, however, a parallel rail had been used, as deep in the middle as the elliptical rail now is, viz. $3\frac{1}{2}$ inches, its weight would have been about 42 lbs. per yard, and the number of broken rails ought to have been the same, the point of fracture only being changed.

This reasoning, theoretically speaking, would be conclusive, had we not the experience of the Bolton, Wigan, St. Helens, and part of

the Liverpool and Manchester railways, wherein such rails have been used, and where very few have yet been broken.

These rails weigh 41¼ lbs. per yard, and are 3¾ inches deep. May we not therefore fairly conclude that experience does not bear out the theoretical advantages of the elliptical rail? The chief causes of failure may, in my opinion, be traced to the defect in fastening the rail into the chair, and the difficulty of preserving the uniform level of the blocks. An attentive consideration of the effect of a heavy body moving along a railway will sufficiently prove this. From the unequal settling, or subsiding, of the ballast, the level of the blocks becomes unequal, and so soon as one becomes lower than its neighbours, every wheel that passes over it strikes a blow and drives it lower. The force of this blow depends on the depression of the block, which not unfrequently exceeds half an inch. When this happens, the weight of the load is alternately thrown to the inner edges or arrises of the adjoining chairs; and thus not only is the weight thrown on one side of the block, but a considerable strain is given to the longitudinal key. In some cases there is an alternate action, first on one side of the block and key, and then on the other, thus producing a rocking motion to the block, which very soon alters its level, and to the key a fretting motion, which soon shakes it loose. When the latter is accomplished, the rail which has very little substance at the bottom is liberated; and it is then, and I believe not till then, that the rails break, for it has been well ascertained that a beam, fastened at the ends, will bear nearly double the weight that will break it when the ends are loose. And this view is confirmed by the fact, that, in nine-tenths of the rails hitherto broken, the fracture has taken place near to the ends.

Another cause of the failure of the fish-bellied rail arises from the want of an under-web. It is well known that the strength of beams is increased by adding to the substance at the bottom, and this increase will be found to be much more important when the rail is subjected to blows, rather than to weights laid or rolled smoothly along its surface. The fibres at the bottom of a beam are more strained than those in the middle, because they lie at a greater distance from the neutral axis.* This will be best understood by a reference to



the drawing above, where a fractured beam is represented. The line *a a* represents the neutral axis; the lines *b b*, *b′ b′*, &c. the position of the fibres of iron or other material dividing the beam into several pivots. Now the extension of the fibre at *c′ c′* is to that of any other

* The neutral axis, or axis of motion, is in that part of a beam where all the fibres above it are compressed; and all those below are extended. It is situated above the middle, but varies in differently shaped beams, and with different qualities of material.

fibre as its distance from the neutral axis, and it follows that at c' c', where the distance is greatest, the elasticity of the material will be first destroyed. This, therefore, is the point where the greatest number of fibres is required, and more particularly to resist a sudden shock, or blow; for, in this case, the elasticity of the lower fibres might be destroyed before those placed nearer the neutral axis had been called into action. The same may be said of the fibres above the neutral axis, which resist by compression; the upper fibres of the rail being further from the neutral axis are more compressed than those below them. The position of these fibres may be compared with the bundle of sticks in the fable: place them in such a manner as to allow them to act together, and they will resist the load, but take them singly, and each will break. A deep narrow bar is certainly the most rigid, but, (as Tredgold has well observed,) although it will bear an immense pressure, the stroke of a hammer will fracture it.

This view of the subject leads to the conclusion, that to increase the depth without reference to the breadth of projection on the underside, is not the way to obtain the best railway bar; and it is to this under-web in the parallel rail, small as it hath hitherto been, that its superiority is in some measure attributed. The obvious remedy for this defect in the elliptical rail would be to give to it this projecting web, but this, even if practicable, could only be accomplished with difficulty.

This comparative view of the two forms of rail refers only to the condition that the bearings be 3 feet apart, and the saving of iron, in this short length, is not so much as would appear from the comparison instituted with 6 feet bearings. I have no doubt that with the blocks much further apart, the elliptical rail, by the addition of an under-web, might be used successfully and economically; but until some means be found by which an under-web can be given to the elliptical rail, I think we ought to confine ourselves to the parallel form.

So far, therefore, as the longitudinal form is concerned, I am favorable to the parallel rail, and the transverse section which I would recommend is that in which, after allowing sufficient width for the carriage wheels to roll upon, a moderate thickness of the rib, (due regard being had to the height of the chair,) all the remaining substance should be thrown into the under-web. It was with this view that I formed the model which you have already adopted, and which has also been adopted by the North Union Railway Company; and taking into consideration a suggestion made after much experience by Mr. Sinclair, that it would be desirable to be able to turn the rail upside down, should the upper surface become defective, I decide upon making the upper and lower rails precisely similar; but this has been accomplished without impairing its strength. It has been stated that this contingency of turning the rail is "dangerous, and done without foresight;" but, (unless it be shown that some benefit is sacrificed,) I cannot see why this project should be so named.

If a rail be not similar, top and bottom, it is evident that we are

confined to one side, which, when it becomes worn or imperfect, is useless, and the rail must be sold as old iron; but if it will turn, even supposing it to have been so much worn as to be too weak for the purposes to which it may have been before applied, it may still be used on sidings, or branch lines, where the engines are lighter, or the speed not so great. That there is an advantage in being able to turn a rail, even to make choice of sides, when first laid, is well known to those who lay them, and therefore this contingency should not in my opinion be so totally disregarded. In preparing this, and the model for the chair, I have had three objects in view.

Firstly, Whilst giving the rail a sufficient bearing surface on the chair, so that one shall not groove or cut the other, I propose to reduce the length of the bearing at least one-half, by which the tendency to rock the block, and tear off the chairs, will be reduced 50 per cent.

Secondly, To prevent the rail from rising in the chair, which is proposed to be accomplished by the large projection on the rail, the filling piece, and the wooden key: which, so long as either of the latter keep their places, will prevent the rail from lifting up.

To prevent or lessen the liability of loosening the key, I propose,

Thirdly, That the filling piece shall only touch the rail for one inch on each side of the centre of the chair, instead of two inches, as heretofore; so that by any flexibility of the rail, or settling of the blocks, the action on the key will be reduced 50 per cent., and that continual fretting or tremor, which is so prejudicial to the long iron keys now in use, will be abated in the same proportion.

The joint chair has two filling pieces and two keys, the object of which is to insure a more certain hold of both rails, and which cannot be done by one key. Each key acts independently of the other, and therefore any working loose of one rail does not necessarily, as at present, liberate the other.

I may here be permitted to make an observation on the wooden key. It is upwards of 8 months since you instructed me to try an experiment with wooden keys on the Liverpool and Manchester line, and I caused about 100 yards to be laid, adapting the key to the rail and chair when in use. The objection raised at the time was, that wood was not sufficiently durable, and that it would decay and become chafed by the working of the rails in the chairs, and thus be worked loose. I was quite aware that this, to a certain extent, would be the case, although I believe not so much as materially to affect the stability of fastening. I have just examined these keys, and have great reason to be satisfied with them. There is a joint rail or two which rises in the chair, but this is caused more from the want of substance in the rail to hold it down, than from the key; some of the keys would bear tightening, others would not, but none were loose; I at the same time examined the rails laid down under the direction of Mr. Stephenson, and found them in very good order; there are but a few lengths laid, but these were upon the whole very firm and solid. I was induced to try the wooden keys, because I believed those of iron were worked loose by the jarring and fretting motion produced by the passage of every carriage over them. There is not sufficient

elasticity in iron thus applied, to yield or adapt itself to the strain which the changed position of a rail, when deflected, throws upon it, and, therefore, wherever this evil exists, iron keys will ultimately work loose. There is more yielding in wood, which adapts itself more uniformly to the side of the chair against which it presses, and does not, like the iron key, touch only in points; and by making the recess in the chair smaller in the middle, and using the wood quite dry, the projecting part of the key expands, by absorption of moisture from the atmosphere, and is thus prevented from being worked or drawn out. It is similar in principle to a cork in a bottle, the middle part of the chair, like the neck of the bottle, being the smallest. It is quite evident, that the decay from long exposure to the weather is the only thing to be guarded against, but I maintain that, if they last but two or three years, they will be found to be economical. Wooden sleepers are not more durable than stone blocks, but still they are used. Why should not wooden keys last as long as sleepers? There must also be less noise from a train where wooden keys are used; the reason is obvious, for the substitution of a softer material between the rail and chair prevents the vibrations of the former from being communicated to the latter.

The successful application of wood for keys is very important, and I regret that these keys were not practically tested when I first suggested them, (now upwards of two years since,) but I shall continue to watch the operation upon that part of the Liverpool line now laid with them, so that we may yet take advantage of any change that time may produce.

I come now to consider the propriety of placing the blocks at a greater distance from each other.

The reasons that have induced me to recommend this to your consideration are not strictly confined to economy, (although I shall be able to show some advantage on that score,) but to a conviction that much of the wear and tear, not only of the rails and chairs, but of the engines and carriages, will be avoided. There is one point to which I wish to direct your attention, viz.: That so long as the blocks are not placed further apart than the axles on the carriages, no more weight can ever at one time be placed on one block; and therefore the blocks do not by this suggested change require to be larger, nor the foundations to be firmer, than they are at present. An inspection of the drawings will render this apparent.

If a carriage bear upon each wheel a load of 3 tons, it presses when immediately above the chair with that weight upon the block. The block and the foundations should therefore be prepared to resist this load; now, if the chairs were placed 2 feet apart, or the blocks put close together, so as to touch each other, the very same weight must be borne to each block and foundation; in short, however close the chairs are placed, they must each bear the weight of the wheel when it comes perpendicularly over it. From this it would appear, that if the axles of the carriage be 6 feet apart, the blocks might be 6 feet apart, without requiring to be larger, or the foundations to be better made.

The axles of the coaches and wagons now in use are about 6 feet apart, none less than 5 feet, whilst the blocks are 3 feet; the injurious effect of this arrangement upon the machinery and road, I will now endeavour to show.

It may have been remarked by the Directors, that on some parts of the Liverpool and Manchester Railway, the engines and coaches have, when in full speed, a very considerable swinging motion, which I believe arises from the inequalities in the road. Instead of the surface of the rails being uniformly smooth, they offer to the wheels a series of inclined planes or waves, and the blocks immediately opposite to each other not being equally depressed, the carriages work upon the springs, and produce the motion already mentioned. Now, the intensity of this motion will depend upon the quick succession of change in the level of the blocks, and if one block be sunk half an inch, and the adjoining one not at all, the rail will be inclined at the rate of 1 in 72. If, again, the next succeeding block be not depressed, the engine has again to rise up an inclined plane of 1 in 72. In some instances the opposite rail is inclined just in the opposite direction, in which case we have two opposite wheels of an engine, one running down hill, and the other up. This I believe is no exaggerated picture; and it is not confined to the Liverpool and Manchester road, but will occur wherever the bearings are so much shorter than the coupling of the wheels. It was the undulating appearance combined with the motion of the engines, (which I have observed on all newly constructed railways,) that first drew my attention to the subject; and I have so far considered it important, as to believe that many of the evils hitherto experienced may be traced to it. The causes producing these effects are obvious. The ballast, as I have before observed, settles unequally. The first settling is assisted by the force with which the engines strike the rail, and this increases as the blocks settle lower. The foundations being unequal, some blocks sink more than others, and at high velocities, the engines, instead of gliding smoothly along the rail, actually jump from joint to joint, and where the depression is half an inch, will jump 20 inches without touching the rail. What will be the effect of a blow of a heavy engine under such circumstances? A broken rail! There seems to me no other way of accounting for the breakage of rails on the Liverpool and Manchester railway, than from this supposition. We know that the new 50 lbs. elliptical rail is stronger in the middle than the parallel, and yet two of these have broken near the middle. This could not be produced by simple pressure. For in the same rail, afterwards tested, the iron was bent nearly double without breaking. Is this not a proof of the existence of sudden shocks produced by the bounding of the engines? Why have so many rails been broken in Olive Mount cutting? Because some of the blocks are resting on the bare unyielding rock, whilst others are upon a thick layer of ballast, which after settling makes the undulations of the rail more abrupt, and consequently the blows from the engines more effectual.

To increase the stiffness of the rail, or, as Mr. Barlow has suggested in a very valuable report on this subject, just published, to place the

blocks immediately opposite to each other, so that the two wheels of a carriage may rise and fall together, is not the way to remedy the evil. The more feasible plan is to prevent the block from sinking, or, what is the same thing, to bring the rail from an inclined to a level plane. This may be partly accomplished by placing the blocks further apart; for if we suppose that the foundations would, with bearings 6 feet apart, still settle half an inch, the inclination of the rail would be 1 in 44, instead of 1 in 72. But, if the settling of the blocks be caused by these sudden undulations of the road, it is clear that by reducing the undulations, the settling will also be reduced, and thus a further approximation to a level will be obtained. I am quite aware, that by increasing the distance of the bearings, the deflexion of the rail itself will be increased; but within a limited distance, this would bear so slight a proportion to the depression of the blocks, that I would rather attempt to reduce the greater, so as to equalize the two evils, than submit to the sudden inequalities produced by short bearings. If the elliptical rail be objected to, because the deflexion, when an engine has passed over a block, is more sudden than on the parallel rail, (the latter being more rigid near the supports than the former,) how much more objectionable must be the sudden deflexions that arise from the sinking of the blocks? If a rail, which deflects 1-20th of an inch, be prejudicial, how much more must it be if depressed five times as much? Nor, with longer bearings, will the keys be so apt to become loosened; for the groove in the chair being horizontal, and the key being driven into this groove, there is clearly less violence done to the fastening, by the rail taking an angular position of 1 in 144, than if such rail were to be bent down to 1 in 72. In short, the nearer the rail approaches to a level, the more likely are the keys to remain fast. If, therefore, by extending the distance between the supports, we can present a more even surface of the rail for the engines to run upon, we shall not only save the wear and tear of the road, and of the machinery, but shall do more towards lessening the breakage of the rails than we can hope to do by simply adding to their weight.

I had previously calculated the load which our rail with wide bearings would support, and I had some doubts whether to recommend you to place the blocks 3 feet 9 inches, or 5 feet apart. Wishing however to take advantage, in this stage of our proceedings, of every circumstance which might ultimately affect the stability of the road, I determined, at the suggestion of Mr. Earle, not entirely to rely on calculation for determining the question, but to make a set of experiments with our own and other rails, at different bearing distances, so that we might not on the one hand omit this opportunity of deriving all the benefit, nor on the other proceed too far without being quite sure of the consequences of the recommendation. That this question was worth the trouble of these experiments will, I think, be apparent by the following estimate of saving, which I had for some time previously made.

If the bearings were increased to 5 feet, we should have 3 blocks to every 15 feet rail, instead of *five*, therefore 2-5ths of all the blocks,

chairs, spikes, keys, plugs, &c., on the line, would be saved, and these would amount to no less a sum than £69,000.

If the bearings were 3 feet 9 inches, we should save 1-5th, and this saving would amount to £34,500.

(TO BE CONTINUED.)

¶ *Cow's Portable India-Rubber Boat.*

Sir,—In your journal of the 20th June last, a correspondent makes mention of an India-rubber boat which was constructed by Mr. Cow, of his Majesty's Dock-yard, Woolwich, in 1829, that is several years before the Americans, who now claim the honour of the invention, ever imagined, or, at least, produced any thing of the sort, and reference is made to a treatise on boats by Mr. Cow, in which the subject is treated of at length. Having in my possession a copy of Mr. Cow's work, I have made an extract from it, which I now send you, of the part relating to the India-rubber boat, in the hope that you will in justice as well to a most ingenious individual as to a very useful invention, give it a place in your widely circulating pages.—Yours, &c.

T.

On the Construction of a Portable Boat for landing and embarking the Horses attached to a Field Gun, or Cavalry of any description, on a beach and through a surf.

One of the most pleasing circumstances resulting from my endeavours to introduce improvements in boats is, that of giving me an opportunity of conversing with officers of rank and experience, and thereby obtaining the necessary information for carrying on the several public services, and what alterations would be desirable in them, could they be effected; a species of information which, from my station in life, I could have no means of obtaining by my own observation. It was during a conversation with Captain M'Kinley, R. N., (who has frequently done me the honour to inspect my propositions,) that he mentioned the difficulties that usually arise in landing or embarking horses on a beach, should there be any surf; and he also particularly stated what took place at the Helder, 1799, when after the General (Sir Ralph Abercrombie) was landed, it was found impracticable for a considerable time to get a horse on shore for his use, which he was exceedingly anxious to effect; it being of the greatest importance that he should be mounted. It was at length accomplished by a captain in the navy, who volunteered his services, mounted the horse, and swam him on shore through a great surf, at the imminent risk of himself and horse. This conversation forcibly impressed on my mind the necessity of some plan to accomplish this object; and it also occurred to me, that could it be effected, it would be a most essential addition to my proposition for landing the mounted field-gun, as then the horses attached to the gun might be landed at the same time, and under the same circumstances of weather and surf. I, in consequence, set about making the most diligent inquiries, not only

at the model-room of the Royal Military Repository at this place, but also of all the officers, old soldiers and sailors with whom I could communicate, as to whether there was any established method of performing this service; and if not, what means were generally resorted to.

Although there are models at the Repository, showing the manner in which horses are hoisted in or out of transports when alongside of a wharf, I could not discover any which applied to the landing of them on a beach; and all the information I could collect was, that they were either placed in flat-bottomed boats, or that two long boats from the transports were lashed together, and a platform laid on them, with stanchions and a guard rope to prevent the horses from going overboard. It must be evident that should the surf extend any distance from the shore, it would be utterly impossible to accomplish the object by either of the methods here mentioned, and the only resource left would be, to get the transports as near as possible to the beach, to hoist the horses out, and swim them on shore; the risk of drowning or laming the horses by this mode must be apparent. Admitting it to be possible to swim horses on shore under those circumstances, I conceive it would not be practicable to embark horses in that manner: for, in the first place, it would be most difficult to get them to take the water through the surf; and even should they be got off, there would be still a great difficulty in slinging them to hoist them in. I am informed that in the retreat from Corunna, in 1809, there were a number of valuable horses in the town the night before the battle; and although there were transports in the bay, yet, from the want of means to embark them, the whole were destroyed.

It may also be stated that the flat-bottomed boat is considered a great evil on board a ship of war or transport; it is very heavy to hoist in or out, and it occupies a large space on a ship's deck; or should they be placed on skids over the quarter-deck, they are, from their elevated position, a great encumbrance.

In order to overcome these difficulties, I constructed a model, of which the following is a description.

My first object was to devise a portable boat, one that might be easily taken to pieces, and stowed away in a comparatively small space, and which might be put together, not only with facility, but by any description of men. During the time I had the superintendence of the building of the boats for Captains Franklin and Parry's northern expeditions, I had frequent opportunities of observing Mackintosh's patent water-proof canvass; one boat was built and covered with it in this dock-yard,* and one by Colonel Pasley, Royal Engineer, at Chatham, for Captain Franklin's overland expedition; and I was strongly impressed with the idea, that a canvass of this description, but much stronger, and finished in a different way, might materially assist me in making the boat portable.

The form of the boat became the next consideration. It was desirable that it should be such as would be best calculated to encoun-

* Captain Franklin did not take this boat.

ter a surf, and not longer or broader than to contain four horses (which number appeared sufficient to land at a time,) and to be of such a depth as to preclude the possibility of the horses springing out. I am sanguine in the belief that I have been successful in the form, as it respects encountering a surf, as I am told she resembles the Massulla boats of Madras.

In order to make the boat portable, and to do it in as simple a manner as possible, the different parts of her frame are connected by iron screws and brass nuts; the screws are so made that they may be turned in by hand, consequently no tools are required, and she may be put together by any men of common understanding. To facilitate which, the four quarters of the frame of the boat are painted of different colours, and marked; therefore it is almost impossible to err; the screws also are all cut with the same die, and the only precaution necessary is with regard to their length. The boat is constructed with a flat floor, and there is a strong platform for the horses to stand on, which is carried sufficiently high to prevent the possibility of an accident; there are three thwarts at the proper height, for the security of the boat, and parting bars are placed on the gunwales, to keep the horses separate and steady. When the frame of the boat is put together, a water-proof canvass covering is put over it, and laced to the gunwales, when she becomes a perfect boat.

As it is intended to draw the boat up and down a beach, it becomes necessary to protect that part of the canvass which may come in contact with stones or uneven ground; therefore she is placed on a sledge, which will keep her nearly a foot from the ground, and also perfectly upright and steady when hauled up.

The boat is twenty-four feet long, eight feet six inches broad, and four feet deep, and when taken to pieces, it may be packed (with the exception of the keel and gunwales) in two cases, each ten feet long, two feet six inches broad, and two feet deep; and is not only competent to carry four horses, but also their harness, and whatever stores may be necessary.

When it is required to land horses, the boat is to be put together on the ship's deck, and hoisted out, the horses must be lowered into her, and secured in the usual way; the boat is then transported as near to the beach as the surf or local circumstances will admit of, a rope previously fastened to the sledge is got on shore, and a sufficient number of men will haul her through the surf and half her length up the beach: the canvass at the fore-part of the boat is then unlaced and rolled under the bows, the screws at the scarphs of the gunwales, at the risings, footwaling, and keel (ten in number), are taken out, when the fore-part of the boat may be removed, and the horses can walk out.

As I have not seen the boat hauled up with horses on board, I am unable to state the number of men necessary to perform it, but I consider it will require between forty and fifty men. When the first four horses are landed, they may be made to assist the landing of the remainder.

When it is required to embark horses, the boat is put together on

the beach, the horses led into her, the bow closed up, and with the assistance of an anchor or boat, moored without the surf, she is heaved afloat.

On the 26th of November, 1827, I had the honour to submit and to explain my model to the Honourable Navy Board, who declared themselves perfectly satisfied with it, and ordered a boat to be built on the above principle in this dock-yard, which was done, and examined by his Royal Highness the Lord High Admiral, as well as by many distinguished officers of the navy and army, and it was subsequently sent to Portsmouth for trial on South Sea beach, but I have not heard that an opportunity has yet offered for doing so.

From various experiments which I have made on the strength and water-proof qualities of the canvass used for the covering of this boat,* I feel justified in stating that it may, and that it will, be used for many important and highly useful purposes, particularly as connected with the naval and military services. It occurred at the battle of Navarino, and also in many actions during the last war, that, at the conclusion of the engagement, the boats when required to board the prizes were found to be so perforated with shot, that they would not swim, and a considerable time elapsed before they could be made effective; and I have heard that many prizes have been lost in consequence of this state of the boats. This was distinctly the case in the defeat of the combined French and Italian squadrons near Lissa, in March, 1811, by the squadron under the command of the late Sir William Hoste. Sir William states,† "I must now account for the Flora's getting away after having struck her colours. At the time I was engaged with that ship, the Bellona was raking us, and when she struck I had no boat that could possibly take possession of her." Also of the capture of the Rivoli by the Victorious, in the Adriatic, in April, 1812, the latter ship's boats were so much injured, that they would not swim, and the prize was boarded by Lieutenant (now Captain) Peak, and one man, in a dingy.

Now if every ship of war was supplied with a covering of this description, previously fitted to one or more of her boats, which covering might be kept below until wanted, however much the boat may be hit with shot, or staved, (provided her form was not entirely destroyed) by placing this covering over her, she becomes in less than two minutes an effective boat, and fit for any service.

In obedience to directions from his Royal Highness the Lord High Admiral, a small boat was built in this dock-yard, on the principle of the horse-boat: she was twenty feet long, five feet ten inches broad, and two feet two inches deep, weighed five hundred weight two quarters, and was packed in two cases, one fifteen feet long, fourteen inches broad, and nine inches deep; the other six feet one inch long,

* This manufacture being composed of two pieces of cloth, united by a solution of India-rubber, is of immense strength. The canvass used for this boat was prepared by Mr. Thomas Hancock, who manufactures this article (for Messrs. Mackintosh and Co.) in London, and was quite a specimen of the perfection to which this mode of water-proofing has been brought.

† Vide London Gazette, May 18, 1811.

one foot ten inches broad, and one foot four inches deep. This boat was taken in the yacht on his Royal Highness' visit to Portsmouth and Plymouth in July last, and was put together at each of those ports, when thirty men were embarked, and she was rowed round Plymouth harbour with that number of men. Not the least weakness was apparent, and not a drop of water came into her. She was subsequently sent to Portsmouth for his Majesty's ship Madagascar, at the request of Captain the Honourable Sir Robert Spencer. Also, two boats, similar to the one supplied to the yacht, have been built for the settlement at the Swan River, Western Australia.

For military purposes I feel confident that portable flying bridges, on the principle of those at Antwerp, and at several towns on the Rhine, might be constructed in this manner with great advantage, and when made light, and suitable to pack in a small space, might be eminently useful to an army.

Perhaps I ought to apologise for presuming to speak on military subjects; and I must again observe, that I pretend to no other knowledge than what I have collected in conversation with experienced officers, and from reading. In Sir Walter Scott's History of Bonaparte, there are many passages which strengthen my statement, viz. that circumstances have risen where boats constructed in the manner above described would be exceedingly useful. In vol. iii., p. 119, Sir Walter states, that "Bonaparte himself observed that the passage of a great river is one of the most critical operations in modern war." Page 122—"They had to pass (the Po at Placenza) in common ferry boats, and the crossing of the advanced guard (five hundred men) required nearly half an hour; so that the difficulty, or rather impossibility, of achieving the operation, had they been seriously opposed, appears to demonstration."

"The vanguard having thus opened the passage, the other divisions of the army (between fifty and sixty thousand men) were enabled to cross in succession; and in the course of two days, the whole were in the Milanese territory, and on the left bank of the Po."

But perhaps the most striking case is mentioned in vol. vii., p. 212, when treating on the advance of the French army towards Moscow:—"The river Willia being swollen with rain, and the bridges destroyed, the Emperor, impatient of the obstacle, commanded a body of Polish cavalry to cross by swimming. They did not hesitate to dash into the river, but ere they reached the middle of the stream, the irresistible torrent broke their ranks, and they were swept down and lost almost to a man."

[*Mech. Mag.*

A Rule for ascertaining the Diameter of a Hollow Cylinder which shall contain the same quantity of matter as a given Solid Cylinder.

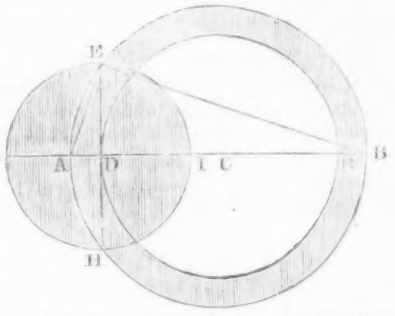
To the Editor of the Repertory.

Sir,—Tredgold, in his excellent Treatise on the Strength of Cast Iron, page 128, 2nd edition, gives a ready method, by geometrical

construction, for ascertaining the radius of a solid cylinder that will contain the same quantity of matter as the tube or hollow cylinder. However it more frequently happens, that, in practice, you require to find the diameter of a hollow cylinder that shall contain the same quantity of matter as a given solid cylinder, the breadth of the circular ring being given; a rule for which I have not yet been able to discover in any work extant. If you think the following rule worthy insertion in your valuable work, it is at your service, and I have no doubt it will be found of utility to those who are in the habit of using cast-iron, particularly when it is considered, that the strength of a column, or shaft, is doubled by expanding the matter into a tube, care being taken not to have the ring less in breadth than three-twentieths of the diameter, otherwise the tube would not be capable of retaining its circular form: three-twentieths ought to be the extreme. If d, be the diameter of the solid cylinder then 0.98 equals the lesser, and $1.4d$ = the greater diameter of the hollow cylinder, when the strength is doubled.

Problem. Given the area and breadth of a circular ring, to find the diameters of its bounding circles.

Construction. Let the circle E G H I be equal to the area proposed. Through the centre D draw the diameters G I and H E cutting at right angles in D: make D A equal to the given breadth, and join A E. From E draw E B perpendicular to A E meeting G I produced in B: bisect A B in C, then is C the centre, and C A, C D the radii of the bounding circles.



Calculation. The triangles A D E and A E B are similar (Eucl. 6. 8.): therefore,

AD: AE:: AE: AB (Eucl. 6.4.)

But $AE^2 = AD^2 + DE^2$ (Eucl. 1.47.) Hence we have

$AD = \sqrt{AD^2 + DE^2}$ by evolution, and the analogy becomes

$$AD : \sqrt{AD^2 + DE^2} :: \sqrt{AD^2 + DE^2} : AB \text{ that is}$$

$$AB = \frac{AD^2 + DE^2}{AD} \text{ or } CA = \frac{AD^2 + DE^2}{2AD}$$

and $CD = CA - AD = \frac{DE^2 - AD^2}{2AD}$ Whence we have the following.

Rule. Divide the sum and difference of the squares of the radius of the given circle and breadth of the ring by twice that breadth for the radii of the greater and less bounding circles respectively.

Example. Suppose the area of the ring or its equivalent circle E G H I to be 201.0624 inches, then will its radius

$DE = \sqrt{\frac{201.0624}{3.1416}} = \sqrt{64} =$ inches; and suppose the breadth of the ring to be 1.5 inches. Then will $AE = \sqrt{66.25} = 8.1394$ inches, then by the preceding analogy we have

$$1.5 : 8.1394 : : 8.1394 : 44\tfrac{1}{6} = AB \text{ and}$$
$$44\tfrac{1}{6} - 3 = 41\tfrac{1}{6} = DR$$

Wherefore $CA = 22\frac{1}{12}$ and $CD = 20\frac{7}{12}$

But to perform the same thing by the rule we have

$$DE^2 = \frac{201.0624}{3.1416} = 64$$

$$AD^2 = 1.5 \qquad = 2.25$$

$$\text{Sum} = 66.25$$
$$\text{Diff.} = 61.75$$

$2\ AD = 3$ therefore

$$CA = \frac{66.25}{3} = 22\tfrac{1}{12} \text{ and } CD = \frac{61.75}{3} = 20^7$$ the same as before.

Otherwise algebraically:

Put $a =$ the given area, $b =$ the breadth of the ring, $\varphi = .7854$, and let x represent the outer diameter.

Then will $x - 2b =$ the inner diameter, and

$4\varphi\,(x - b) = a$ by the property of the circle.

Therefore $x = \frac{a}{4\varphi} + b =$ the greater diameter, and

$\frac{a}{4\varphi} - b =$ the less. But $4\varphi = 3.1416$.

Wherefore the expression for the diameters is

$$\frac{a}{3.1416\,b} \pm b. \quad \text{That is}$$

3 B 2

Divide the given area by 3.1416 times the breadth, and the sum or difference of the quotient and breadth will give the greater or less diameter accordingly, being a rule preferable to the one derived from the construction. Or, divide the square of the diameter by four times the breadth, and the quotient increased or diminished by the breadth will give the diameters. I am,

Your obedient Servant,

May, 1834. G. Gottam.

[*Rep. Pat. Inv.*

Patents in Great Britain.

The principal grievances of which inventors have to complain in the new patent law of Great Britain, are briefly these:—

First. The enormous Expense for Patents.

The cost of a patent for a new invention for England, Scotland, Ireland, and the Colonies, is, including the specifications, seldom short of 400*l.* The cost of entering a new book at Stationer's Hall is only half a crown. Inventors are taxed as no other subjects of the Crown are taxed—taxed to an extent which is in all cases oppressive, and amounts in many to absolute interdiction.

Second. The Short Duration of Patents.

The author of any new book or pamphlet—new song or ballad even—is entitled by law to the exclusive copy-right thereof for the space of *twenty-eight* years certain: and for as much longer a period as he may be in life after the lapse of the twenty-eight years. But the inventor of any new instrument, machine, or process, in the arts—no matter how valuable—is only allowed an exclusive property in it for *fourteen*. In the eye of justice, though not law, however, the claims of both stand on precisely the same foundation.

And, *Third. The vexatious Multiplicity of the Forms of Procedure in taking out Patents.*

Most of these forms of procedure exist *for the mere expense sake*, and for no purpose of public utility whatever. Three separate patents and specifications are required for the three kingdoms, when one for all three might and ought to suffice.

NOTICE TO READERS.

We beg leave to call the attention of our readers who may be interested in the matter, to the advertisement upon the cover of this Journal, of the sale of the collection of Minerals belonging to the Baron Lederer, Austrian Consul General. They will be disposed of at public sale in New York, on the 1*st day of May*, 1836.

CELESTIAL PHENOMENA, FOR JANUARY 1836.

Calculated by S. C. Walker.

Day.	H'r.	Min.					
27	14	1	Im.	χ' Tauri,	,5,6,	N. 14°	V. 192°
27	14	47	Em.			234°	283°
28	8	54	Im.	Tauri,	,6,	74°	90°
28	10	14	Em.			312°	361°
29	7	7	Im.	139 Tauri,	,5,6,	147°	93°
29	8	11	Em.			236°	194°

Meteorological Observations for September, 1835.

Days.	Therm. Sunrise.	Therm. 2 P.M.	Barometer. Sunrise.	Barometer. 2 P.M.	Wind. Direction.	Wind. Force.	Water fallen in rain.	State of the weather, and Remarks.
							Inches.	
1	51°	64°	29.96	30.00	N. NE.	Moderate.		Cloudy—lightly cloudy.
2	44	65	30. 5	.10	W. NW.	do.		Clear—flying clouds.
3	52	73	.15	.20	SW.	do.		Clear day.
4	52	75	.20	.20	SW.	do.		Clear day.
5	62	77	.20	.15	W. SW.	Brisk.		Cloudy—clear.
6	64	82	29.95	29.85	W.	Light.		Cloudy—rain in night.
7	63	66	.90	.85	W.	Moderate.	.62	Cloudy—flying clouds.
8	49	69	.85	.90	W.	do.		Cloudy—clear.
9	56	71	.90	.85	E.	Calm.		Clear day.
10	61	74	.83	.85	W.	Moderate.		Fog—lightly cloudy.
11	56	68	.90	.90	N. NW.	do.		Clear—lightly cloudy.
12	60	61	.90	.80	NE. W.	do.		Cloudy—rain.
13	56	64	.75	.95	NE. W.	do.	2.15	Drizzle—cloudy—rain.
14	58	63	.85	.95	NW.	do.	.2	Cloudy—flying clouds.
15	45	61	30.30	30.30	NW.	do.		Clear day.
16	43	62	.33	.26	W.	do.		Clear day.
17	49	65	.24	.20	SE.	do.		Lightly cloudy—clear.
18	52	70	.00	.00	SE.	do.		Cloudy—flying clouds.
19	60	67	29.90	29.65	SW.	Brisk.	.31	Cloudy—rain with high winds.
20	51	64	.32	.32	SW.	do.		Clear day.
21	32	63	.40	.40	SW.	do.		Clear—flying clouds.
22	47	63	.70	.80	W.	Moderate.		Clear—lightly cloudy.
23	47	58	30.00	30.00	W.	do.		Clear—flying clouds.
24	43	57	.6	.6	W.	do.		Clear—flying clouds.
25	43	59	.10	.15	W.	do.		Clear—lightly cloudy.
26	47	62	.30	.21	NE.	do.		Lightly cloudy—clear.
27	43	61	.00	29.85	SW.	do.		Clear—floating clouds.
28	54	62	29.63	.63	W.	Brisk.		Cloudy—flying clouds.
29	46	55	.66	.66	W.	Moderate.		Lightly cloudy.
30	41	52	.65	.65	W.	Brisk.		Clear—flying clouds.
Mean	51.87	65.13	29.91	29.91			3.10	

	Thermometer.	Barometer.
Maximum height during the month,	82. on 6th.	30.26 on 16th.
Minimum do.	41. on 30th.	29.32 on 20th.
Mean do.	58.50	29.91

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